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ABSTRACT

The main purpose of this study was to trace the development of children's awareness that they can learn and to describe the forms of their ideas of learning. A complementary aim was to account for the extent to which such conceptions can be found at different levels of development. The investigation consisted of two observational studies and a series of six interview studies with 300 Swedish children ranging from 3 to 8 years of age. The child's idea of learning was dealt with in terms of what is learned and how. Concerning what is learned, findings suggest a developmental progression from learning to do, to know, and to understand; findings also indicate a corresponding set of answers to the questions of how. Developmental differences were found in children's awareness of different forms in which one can learn. It is concluded that preschool education to a large extent relies on conceptions which most children of preschool age lack. Appended are coding criteria, interview questions, and descriptions of related age trends and the child's conceptions of "to be able," "to know," "to understand," "changes in thinking," "to find out by thinking," and of "what it takes to learn a phone number." (RH)

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The child's conception of learning

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The child's conception of learning

ABSTRACT

The research approach adopted in this thesis is that of *phenomenography*. The focus is on the description of people's conceptions of various phenomena in reality. The phenomenon dealt with is learning, a classic topic of interest in psychology as well as education.

The main purpose of this study has been to trace the development whereby children become conscious of the fact that *they can learn,* and to describe the qualitatively different forms that their ideas of learning subsequently take. The primary stress is on the identification of the different conceptions of learning, but a complementary aim is to account for the extent to which these conceptions can be found at different levels of development.

Since conceptions are seen as developed in a context, and since the first official and structured learning milieu the child meets is the pre-school, this was chosen as the context within which children's conceptions are examined. Ideas and reality in pre-school are considered and empirical studies are carried out of some learning situations in which different themes have been worked with to give children some knowledge about the world they live in.

The investigation consists of two observation studies and a series of six interview studies, carried out in the form of individual interviews, with a total of 300 children, from the age of 3 to 8 years.

The child's idea of learning is dealt with in terms of its two related aspects: *what* we learn and *how* we learn. Concerning the first aspect there seems to be a progression from learning TO DO (how or that) to learning to KNOW, and later to learning to UNDERSTAND. To each of these answers to the questions of *what* there is a corresponding set of qualitatively different answers to the questions of *how*. Development in this respect goes from an inability to distinguish between TO DO (to know, to understand) and TO LEARN TO DO (to know, to understand), to seeing a transition between a state of BEING ABLE, simply as a function of GETTING OLDER. At the third level, the child realizes that learning (i.e. becoming (more) able) comes about by EXPERIENCE. Experience, again, may have three distinctively different forms, namely, learning by DOING, learning by PERCEIVING and learning by THINKING. There are also developmental differences in the awareness of different forms in which one can learn.

This study presents an educational perspective on the metacognitive task of reflecting about one's own learning. In looking at children's conceptions of their own learning in the light of the context of pre-school, it becomes obvious that *pre-school education to a large extent relies on conceptions which most children at these ages lack*. As a consequence, to create a milieu which makes children aware of their own learning one must begin to look at children's conceptions and educate from the child's point of view.

Keywords: development psychology, learning, metacognition, phenomenography, pre-school, qualitative research.

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Keywords: development psychology, learning, metacognition, phenomenography, preschool, qualitative research.

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The first step in this dissertation was taken ten years ago when I was working as a pre-school teacher reflecting about, and making observations of children's behaviour in pre-school. My interest grew further during my years as a teacher in the methodology of pre-school activities at teachers' training college, during which time I visited a number of different pre-schools and had opportunities to reflect on the activities I observed.

My special focus on children's conceptions of learning commenced four years ago when I begun my doctoral studies and at the same time started to work in a research project within the INOM-group at the Department of Education, University of Gothenburg. My education has to a great extent taken place in seminars and during lunch- and coffee-breaks with different members of our research group, to whom I am very much indebted.

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Ingrid Pramling

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PART I. BACKGROUND

1 INTRODUCTION

> *Do you speak German?*
> *I do not know, I have never tried.*
> *P.G. Woodhouse*

These two sentences derive from a novel by P.G. Woodhouse, but could just as well illustrate a child's reply to a similar question. We who come into contact with children continuously, as teachers or parents, probably all can relate entertaining anecdotes based on children's statements. We venture to say that most of these statements are considered as a joke or amusing remark. But let us look at it seriously. Children do not say things to amuse us, but to communicate something to us. What the child expresses is a reflection of his way of thinking about the world around us[1].

From the research findings of Piaget we know that the child's way of thinking is different from the adult's (see, for instance, Gruber & Vonèche, 1977) - but what does the child's way of thinking mean more precisely with regard to a particular phenomenon? This study intends to contribute to knowledge of how the child perceives the world around him with regard to the phenomena of learning.

In everyday life, as well as among researchers, learning is spoken of as *one* phenomenon, but as Svensson (1979) points out, learning is several phenomena depending on the context.

> *The content-dependent meaning of learning cannot be described in terms of either characteristics of the individual or characteristics of the situation. Such characteristics do not represent phenomena of learning. Learning must be described in terms of the internal relation between individual and situation.*
> *(p. 12)*

From this point of view learning can be seen as a phenomenon of both the culture and the context within which the child meets the phenomenon.

The assumption that the culture as well as the context - in a more narrow sense - is of importance for how children perceive learning, was investigated in one of the pilot studies (Pramling, 1981). A comparison was made between the conceptions of learning by Indian and Swedish children in the context of pre-school. These observations of differences are only preliminary, not only because of the small group of Indian children (10 individuals), but also because of the bias involved in translating questions into English, then to Oriyan (the Indian children's language) and then the answers the other way round again, even though the interviewing researcher also translated questions and answers. Despite these uncertain factors, however, it is interesting to notice how the Swedish socially oriented pre-school was reflected in the child's mind in terms of play and behaviour while Indian children perceived pre-school as a place of knowledge. It seems obvious that the culture and context a child is involved in has a great impact on his conception and awareness of learning. The Indian pre-school studied was explicitly structured towards particular knowledge, while the Swedish pre-schools as a rule are more unstructured with no focus on skills like reading or counting. These two different pre-school settings constitute good examples of the cultural and contextual impact on conceptions of the phenomena of learning.

One could of course say that children also have a home milieu which has an impact on their awareness of the world around them. But from the study reported above there is reason to believe that the pre-school setting has a determining importance in creating children's conceptions of learning. The idea behind this statement is that it is in more organized learning situations that the aspect of learning becomes actualized or could be actualized to the child.

The approach of this study is to see children's conceptions of learning represented from an educational perspective. This means that conceptions of learning are studied in the light of their context, which is chosen here as the pre-school.

The structure of this thesis comprises three parts; background description, the main results, and a final discussion. Since the educational perspective has also to be seen in the light of development, three schools of cognitive development theories constitute the frame of reference, the well-known Piagetian, that of Heinz Werner, and metacognitive theories under which this study could be grouped. Just as important a frame of reference as the above is the tradition of the INOM-group (a research group of the Department of Education, University of Göteborg, studying learning and people's conceptions of the world around them). Characteristic for this tradition of research is an explorative design with the main focus on qualitative analysis of thinking, as it is revealed in a clinical interview situation. This study is also mainly carried out by clinical interviews, a not unproblematic approach but one which has been dealt with and developed.

In the light of what was mentioned earlier about the necessity of describing learning in terms of its content and context, the Swedish pre-school will constitute another background. This means that ideas about, as well as the reality of the Swedish pre-school are taken into account in this explorative study. Since we have found the importance of contextuality with regard to conceptions of learning, two empirical observation studies have also been carried out as a background for the main studies, the latter being dependent on interviews.

The two observation studies have their focus on activities in pre-school which were more precisely directed towards learning. These observations were seen in the light of the teacher's intentions as well as in the light of how children perceived these learning activities. Analysis is carried out with regard not only to what children perceived of the learning situation as such, but also to what children perceived of the content of the theme worked with in different activities.

What has been described so far, i.e. the theoretical frame, descriptions of Swedish pre-school, and the observation studies, will together constitute the base for the second part of the thesis comprising the results of the main studies. These are a series of six interview investigations, in which knowledge has been developed of children's awareness of learning as well as of the methodological aspects of interviewing young children.

During the five pilot studies, interviews were carried out with varying but partly overlapping sets of questions. In the sixth study, questions were more standardized as we by that time had reached a set of questions which functioned well. These questions were given to all children to the extent that it seemed meaningful in view of their capability of answering. 149 children, between 3 to 8 years of age, were involved in the sixth study but the whole basis for the thesis is approximatly 345 interviews within this age group. Children were chosen at random from pre-schools in varying areas of the city of Göteborg. A criterion for choosing pre-schools has been the inclusion of areas where there is good coverage of the need for whole-day pre-schools, in order to avoid a socially slanted choice of children.

The main results derive from these interview studies.
These results are of two different kinds, qualitative and quantitative. For the qualitative description of children's conceptions of learning, which should be seen as the main results, all interviews have been utilized. The other aspect of the results, which is of quantitative nature, is analysed from the sixth study. The qualitative results are categories of descriptions, which means that one could characterize different forms of children's way of thinking about learning. The quantitative results on the other hand are frequences of the occurrence of conceptions at different age levels.

The results will be described in terms of the two different aspects of learning, namely, the *what* and *how* of learning. We would also like to mention the obvious age trend which is very outstanding in the data, and which can partly be characterized as non-linear, i.e. where the frequency of a certain increases up to a certain age and then decreases again. The most common age trend however is where conceptions increase continuously by age.

Finally, in the third part of the thesis there is a discussion of the child's way of thinking about the phenomenon of learning in the light of development and contextuality. Educational implications for pre-school activities will also be discussed here.

In conclusion, we wish to stress that this study should be seen as an investigation within the framework of the new area of metacognitive research and, in line with that recently established tradition, the aim is to obtain a broad view of the child's awareness of learning. Since learning in general is our focus, its various instances will of necessity be briefly dealt with and the depth of exploration will be fairly limited. A further step in a study like this would be to focus interest on particular aspects of the phenomena of learning, but this is not possible within the frame of the investigation at hand.

It becomes important to find out how children perceive learning, if we believe that the child's conception of, or thinking about learning is related to the child's way of dealing with learning situations. Säljö (1982) has shown a relation between adults' conceptions of assumptions and the outcome of a learning task, and there are reasons to believe that this relation also holds with regard to children's learning. What we will see in this study is how the child's awareness or assumptions of learning expresses itself during his early years, when he is exposed to the culture via educational settings in pre-school.

2 VIEWS ON DEVELOPMENT

The development of thoughts has fascinated philosophers for centuries and in this century has also become an increasingly flourishing domain in psychology. Present interest in thinking processes may be due to the fact that modern society rewards a high level of abstract thinking. Following on development in technology far more demands than before are placed on the individual to read, write and understand symbols in a broad sense. The work carried out by scientists for centuries has greatly increased the body of knowledge. This scientific knowledge, which is always described in the abstract form, derives from concrete reality. Theories developed by scientists have to be understood from knowledge about the world, which is quite different from the everyday experiences which are dependent often on a person's perception. These two perspectives, the scientific and the everyday, can sometimes be totally contradictory, but despite the contradiction both perspectives can exist within the one individual, depending on the phenomenon talked about, (Brumby, 1979).

Feldman (1980) discusses the development of conceptions in terms of a development in different areas. These areas are general, cultural, discipline-based, idiosyncratic and unique achievements within a domain. Feldman believes that there must be certain general levels of development preceding the development of the cultural, certain cultural development preceding the development of the discipline-based etc. With regard to the universality of thinking in a society, he states that ways of thinking which are more or less common can always be found. The way of thinking which can be described as universal in a culture or within a discipline has once been considered as the unique ideas of a small group of people. Feldman thinks that whether the unique ideas are to be universal or not depends on "natural selection", which means that the development of knowledge as well as biological development progress in a similar way, although the development of knowledge progresses faster than biological development. As a consequence, there are always some ideas developed before people in general have any use or understanding of them.

Feldman's idea of development is, in other words, a development within a body of knowledge outside the child's mind. This means, that developmental stages are located in the knowledge domain and not in the child's head.

Another perspective of development is treated by van der Bergh (1975). The historical development of thoughts can sometimes be seen as constituting the development of thoughts within the child. Before modern man reaches the abstract way of thinking he must sometimes go through ways of thinking which can be traced centuries back; it is, thus possible to find the historical development within a person's development.

The most common way of describing development of thoughts is within an individual during a certain period of time, as e.g.,from birth to adult age. Development has to a large extent been connected with maturational and biological factors, in other words, with the inherent capacity of the child. Research in the cognitive domain of development in children has been carried out in experimental settings, where the child has to face a learning-situation in a wide sense, or where he has to solve problems of various kinds. Since the child's way of thinking cannot be observed as such, the researcher makes conclusions about the child's mental activity from the child's way of acting. In the kind of research which has been, and still is, predominant in this field, the assumption is that there is a correspondance between acting and thinking. The young child's acting and thinking is simultaneous which means that researchers take the child's acting as evidence of the child's thinking (Stevenson, 1972). However, the child comes to a point where thinking precedes action and where the way to act depends on conceptions and thoughts (Gibson, 1969).

This study does not deal with the correspondence between acting and thinking but is focused on the child's conception and awareness of the phenomenon of learning mainly as it is revealed by what the child says.

Three different views of development have been chosen as a theoretical frame for this investigation. There are similarities but also differences between them. They all deal with development within the cognitive domain, more specifically with people's way of thinking of the world around them in various ways but they all reflect some different perspective on development.

It is hardly possible to attempt a developmental study in the 1980's without considering the theory of *Jean Piaget*. He is by far the most respected and accepted authority of the 20th century in the field of cognitive development. Many later researchers have been influenced by him, and in Sweden his theory has been chosen as a basis for pre-school education. Since this study is carried out in the context of the pre-school it seems natural, therefore, to start with a brief examination of his theory. This theory is described by Piaget himself as a universal cognitive developmental theory without any particular relations to the culture which the subject is a part of. However, the theories of Piaget referred to here are mainly from his early and latest work, which seems most relevant for this study. Piaget seems to have returned to his early way of thinking in his later studies.

Since one of the assumptions of this study is the context's influence on the child's conceptions and thinking, *Heinz Werner's* theory has been chosen to illustrate the cultural and functional view of thinking. Werner's theory is not as widely known as the theory of Piaget, but will serve as a good complement. Werner's theory has inspired the approach of the work carried out by the INOM-group.

A third view of development is represented by *studies of metacognition*. This part of the background has its focus on descriptions of different examples of studies. Since metacognition is a new domain within psychology, developed by different researchers, and in which views are not entirely compatible, it is difficult to obtain a coherent theoretical framework (Kreutze et al, 1975). A further difficulty is the differing content in focus for investigations. Though the content in focus in many studies is very close to the questions in this investigation,the present approach is quite different from the traditional one in the field.

The views of development mentioned above constitute the theoretical framework of this study and will now be described in more detail.

2.1 Jean Piaget

When Piaget died some years ago he left a huge amount of scientific work in the field of child psychology behind him. During more than half a century he spent his life discovering, proving and describing the nature of the development of thinking in the child. His epistemological work had its roots in the field of biology where he started his career, and which is traceable as background throughout his work. His interest in psychology began when he worked at Binet's Institute, partly with testing the intelligence of the child. Piaget became concerned with those children who failed in the test. He asked himself: "In what way do these children who fail, think?". It was a short step towards the consideration of children's thinking in general.

Piaget pointed out early in his work that observations of young children were necessary, but not sufficient, for drawing conclusions about the child's way of thinking, (Piaget, 1975). Piaget's interest was basically *epistemological*. His philosophy is based on a circle of science, which means that

> *a specific science leans back upon its neighbour for consolidation in full circle. In such a system, logic warrants psychology; psychology biology; biology, chemistry; chemistry, physics; physics, mathematics; mathematics, logic. At the same time logic founds mathematics which founds physics etc. (Gruber & Vonèche, op cit p. 743)*

This holistic view of knowledge also explains why he, in his later work, argued for cross-disciplinary teaching when talking about the education of the future (Piaget, 1976).

The theory of Piaget is *structuralistic* in character and can be seen from three main notions, holism, transformation and self-adjustment. Elkind (1976) gives an example of society seen from a structuralistic point of view in terms of the three main notions.

> *A society is another example of a phenomenon that can be described from a structuralist standpoint. Every society is greater than the sum of the individuals who make it up. Social institutions such as the family cannot be reduced to the individual members who make it up. Rather, it is the relationships between the individuals that constitute the institution in particular and the society in general. Within the society there are also rules of transformation by which individuals move from the estate of childhood into adulthood, from single to married, and so on. And finally, each society has principles of self-regulation, moral codes, laws, taboos, and religious values which serve both to control behavior and to correct it when it goes awry.*
> *(p. 8)*

2.1.1 Some main factors in development

On the subject of the development of thinking in the individual, Piaget states that biology and knowledge are factors of development which can be more explicit in (1) maturation, (2) experiences with the physical environment, (3) experience in the social environment and (4) equlibration, (Gruber & Vonèche, op cit).

2.1.1.1 Maturation

Maturation means that there is a structure built in the child, representing different premises for thinking in different ways and related to the development of his biological structure. This is not a static one-way process, but an *interactionistic* process where knowledge creates maturity and maturity creates knowledge. It is, in other words, a continuous on-going process. Although the theory of Piaget advocates an inter-actionist view of the maturing child and the world around him, maturation is seen in a sense as static, in relation to the different *stages*, which according to Piaget are fairly stable with regard to different age-levels. These distinguishable stages are *hierarchical*, which means that they all build on each other or arise from each other. In the development of thoughts about a particular theme as well as thoughts in general, the child has to go through all of these stages; no one can be left out. Learning can, as it were, only take place at the stage the child is at.

2.1.1.2 Experiences with the physical environment

According to Piaget, thoughts are created by means of concrete *acting* in reality. This means that action always precedes thoughts in the young child. We will come back to the importance of concrete acting later when the stages are described . Let us instead look at the experience with the physical environment in relation to understanding and consciousness. Since the development of thoughts and comprehension through action is one of the fundamental ideas of Piaget we will refer to two of his later works: The grasp of consciousness, 1976 and Success and understanding. 1978.

Consciousness is described as a process of awareness in dealing with experimental tasks emerging from a) a motor action without conceptions, but based on a scheme of well-developed "know-how" via b) a level where the result of the action is conceptualized in different aspects which are comparable with their scheme, and eventually reaching the level of c) "reflected abstraction" where the child is able to do second-order operations, which means that he is able to make new combinations of operations from the earlier one. The awareness starts with external actions when the child deals with a task without any linked thinking. Later on acting is combined with thoughts,and finally it becomes an internal thought-process worked out before dealing with the task.

Consciousness develops from the periphery to the centre. The child observes the object as well as its own actions and reaches an understanding of the periphery, of how objects are and of the result of their own acting. These are the insights the child acquires from observing facts while the co-operated inference, the operation going on when the task is to be solved, always has its origin in the logic of the child. There is,as it were,a reciprocal but alternating action of the child's observations of the object and the action and vice versa, which is followed by a stabilization in the inference. This process progresses with varying speeds depending on the task the child has to solve. If solving a task places the child in a situation where earlier schemes come into conflict, more problems arise which must be solved. Before the child has changed his scheme on a conscious level, he will distort the observation and he seems to suppress the cause into the unconscious. "Putting out of mind" is a common way of dealing with situations of conflict, but as it happens automatically, the child never feels the conflict. There are different degrees of integration which have been made between the object and the child's mind. The child is able to structure reality in operations a long time before he is aware about his own cognitive structures.

When Piaget talks about understanding, he refers to understanding in thoughts to the extent that the child is able to solve the problem of "how and why" from the observed elements, and apply it in action. Success means having equivalent understanding of the situation to use it effectively. In this process, the positive elements are primarily superior to the negative ones. The direction of solving a problem goes from the past (earlier experiences) to an openness towards unpredictable ones.

The grasp of consciousness, as well as understanding, evolve from the conceptions acquired from actions. But some time in a child's life this process is reversed, and it is conceptions which guide actions. The development of awareness goes from the external world to become an internalized part of the child's consciousness. There is a circular relationship between the child and the object.

> *The subject only learns to know himself when acting on the object and the latter can become known only as a result of progress of the actions carried out on it. This explains the circle of the sciences, of which the solidarity that unites them is contrary to all linear hierarchy. Furthermore, and most important, this explains the harmony between thought and reality, since actions spring from the laws of an organism that is simultaneously one physical object among many and the source of the acting, then thinking, subject.*
> *(Piaget, 1976, p. 353)*

2.1.1.3 Experiences in the social environment

Piaget points out social experience as one of the main conditions for development, but he never elaborates or takes any deeper interest in the social environment. And why should he, as he sees the cognitive stages as universal? He deals more directly with the social environment when he says that it is easy to inhibit a creative child so he looses interest in going further. Experiences in the social environment seem to stand in more general terms for what the social environment can offer in the way of challenging activities for the child, which at the next step can inhibit or facilitate his development. This means that the adults attitude is more in focus than social interaction with the child.

2.1.1.4 Equilibration

Another of the main conditions for development is the striving for equilibrium in biology and knowledge in the child. This is a continuing process. The child develops an idea of something in reality, into which he then assimilates other experiences. There is now a state of equlibrium. But when the child has had experiences which do not seem to fit into his idea, a state of disequilibrium is the result. As the child aspires in his thinking process to achieve a state of equilibrium he now has to *assimilate* these new experiences or to *accommodate* his old idea. This process of *adaptation* is the basis of cognitive development, where development strives continuously towards an equilibration of the process of assimilation and accommodation. Evolution comes when the thinking process influences the impressions and expressions from the physical reality as well as from the social milieu. As cognitive development is seen in terms of a changed way of thinking, development takes place when the child is able to make an accommodation to the new reality.

2.1.2 Stages of development

Since the age levels of children participating in this investigation correspond to the age-levels which are assigned to the second and beginning of Piaget's third stages, these stages will here be described in relation to the notions of importance of these stages. The first and fourth stage will only be mentioned briefly.

2.1.2.1 The stage of sensory motor thinking

The first cognitive stage is labelled by Piaget as the sensory-motor stage (0-1½ years). This is a period during which the child develops from a state of solipsism to gradually becoming aware of himself and of objects around him. Piaget states that there is nothing in the first months of a child's life which shows any kind of representation in the consciousness of the child if the object is not visible. The sensory-motor intelligence is described by Piaget in six stages during this first stage of cognition (see further, Gruber & Vonèche, op cit, chapter 19). These stages are related to the child's construction of reality, which means that he gradually becomes conscious of objects, by interacting with physical reality. Thus the child's construction of reality in his way of thinking begins as early as the sensory-motor stage.

In experiments with e.g. objects we can see how the child first looks visually and then manually for an object taken away from him. When, at the end of this stage, the child actively looks for a disappeared object, it is taken by Piaget as a sign of conservation of an object, which means that the object exists mentally for the child.

2.1.2.2 The stage of pre-operational thinking

The second stage is labelled the pre-operational (2-7 years) period. As we have seen,the sensory-motor infant operates by means of direct actions, while the pre-operational child is capable of operating by means of *representation*. He acquires a general capacity for dealing with symbolic functions. Piaget calls it *delayed imitation*, which means that the child is now able to imitate persons or activities after they have been involved or exposed to them. This is a sign of being able to symbolize reality for use in a different setting.

> *The paramount requirement for representation is what he calls the ability to differentiate 'signifiers' from 'significates' and thereby to become capable of evoking the one to call forth or refer to the other.*
> *(Flavell, 1963, p. 151)*

An example might be the young child who,having been exposed to traffic in the streets, comes home and begins to move his roll to and fro on the table at the same time as he makes sounds like an engine, instead of eating the roll. The child has here differentiated the signifier (the car) from what it signifies (the movement and sound).

This general representation shown in the child's imitation is a process going from external imitation to internal imitation.

In the process of development of symbolic function, language aquisition increases greatly. Words are the most usual signs, where meanings are socially shared and arbitrary in the sense that they bear no systematic resemblance to their significates. On the other hand, symbols are more or less private, noncodified signifiers which usually bear some physical similarity to their referents. The child's spontaneous language is not intended to express thoughts. The word is connected with action from the beginning, and later on used to redeem action (Piaget, 1973).

Another general characteristic of the pre-operational child is *egocentrism* (Piaget, 1973; Piaget, 1975; Flavell, 1963, 1977). This means that the child sees everything from his own perspective since he lacks orientation in other roles. The child is not able to imagine, for instance, what something looks like from another person's point of view. An example of this egocentricity is when the child keeps chatting and asking questions all the time though he has been asked to be quiet for some particular reason. It is not through mischief or lack of respect that the child "disturbs", but his lack of being able to adopt another person's point of view.

The child is now able *to think* but not to think about his own thinking. As a focus of this investigation, this phenomenon will be returned to. Since the child is not able to take other perspectives,he has to depend heavily on perception. This is what Piaget calls *decentration:* the child's focusing on variables which demand his attention most. The child is confined to the surface of the phenomenon; to what is visible. Piaget's classic example is pouring liquid over from one glass to a wider or thinner one in front of the child. The child depends here on his visual perception and says that there is more in the one which looks the most,from his point of view. This phenomenon is due to a lack of decentration, of taking into account features which could balance and compensate for the distortive, biassing effects of single decentration. This means that a pre-operational level of thoughts is rather static and immobile. These primitive concepts, pre-concepts,tend to be action-based, imaginative and concrete. As a consequence, the child cannot distinguish a number of a given class, varying in appearance. Flavell, (1963), refers to a situation with one of Piaget's children, 2:7 years old, who asks her mother what the name of the baby was when her sister had on a new swimsuit. Piaget says "... as if her sister had changed her identity in changing her clothes" (p. 160), (compare findings on p. 108). Children are at this level unable to form conceptions of change or probability. Everything must have its *identifiable cause.* Piaget talks about *juxtaposition* and *syncretism* which represent two aspects of relating phenomena or going directly from premises to conclusions. It is an *intuitive* process, which is characteristic of other situations at this level. The child is,as it were,able to break down what he hears or sees into fragments, e.g. a story or wholly coherent explanation,and then has the tendency to connect these fragments to everything else.

Another step in the characteristics of the pre-operational way of thinking would be what Piaget calls *phenomenalistic causality*, which means that the child believes that two things happening simultaneously are each other's cause. There is,in other words,no limit in his world for what can follow as a consequence of what. Another characteristic is the *finalism* of the child, comprising a difficulty in separating fantasy and reality. Finalism makes it difficult to distinguish external and internal events. A child could without any hesitation say "Li has got big feet to be able to run faster". It is a process of *externalisation*, which means that the child projects his own mental activity on to the surroundings (Elkind, 1976).

Animism stands for a conception where everything around the child is animated. Since the child has a mind, everything around him must also have one. What is cause and effect is of course a relevant question since this is a normal way for adults to deal with infants. Let us take the case of the young infant who bangs his head on a table when trying to stand under it. The grown-up tries immediately to give consolation by saying "that naughty table, did it hurt you?". But whether it is a phenomenon reinforced by culture or not, my son Tommy (when 6 years old) went on a trip with his big teddy-bear. After his departure I realized that 2 kilos of honey had disappeared from the pantry. His explanation was, of course, that he wanted to bring food for his teddy-bear. After some time I brought the matter up again and asked him if he really believed that the teddy-bear could eat honey. "No", he said, "but I wished so hard that the teddy-bear was alive that I imagined he was".

Another characteristic of thought is *artificiality* which means that the child believes that everything is artificially made by someone, not only in the material world but also in nature, e.g. lakes, mountains, etc.

The last notion of importance for this level of thinking of relevance here is *realism*, which is considered as a lack of differentiation between the child and the world around. When a child is talked about as realistic it means that he in almost all domains tends to consider things as external objects, to "make real" the contents of his consciousness (Rutschi-Herramm et al, 1973). From the child's point of view, the world appears absolute, in which even psychological experiences are seen as concrete and physiological. One aspect of realism is the child's lack of differentiation between the symbol and the antecedent. The child, for instance, believes that a name or a word for an object is a part of that object. The name of an object or person represents a quality of that object or person. One example might be that a young child cannot accept that someone else has the same name as he has. I have noticed many times at pre-school, with young children sitting around a table, that when one starts saying "my mother" (without any mother being there), a second later the next child will continue "my mother", and this can go on to a real quarrel when the child begins to cry,since "mother" is mine and nobody else's. Only one mother exists and she is mine!

For a child at the pre-operational level of thinking, only one world exists and that is his own, which means that for the child there is no clear distinction between play and reality as different cognitive realms.

Although Piaget characterizes the pre-operational way of thinking as one level up to about the age of seven, he refers to the upper period of the pre-operational stage (5-7 years) as an intermediate stage, characterized by far more *flexibility* in the way of thinking.

> *Regulations of the mid-station between irreversible centrations and rigorously reversible operations, are characteristic of intellectual structure in the late pre-operational years.*
> *(Flavell, 1963, p. 163)*

2.1.2.3 The stage of concrete operational thinking

The third stage of thinking is labelled by Piaget as concrete operations (7-11 years). The child has now internalized a pattern of actions in his mind and does not have to act in a concrete way, but is able to act in his mind. The child is now able to think first and then act, whereas previously the child had to act first and the thoughts came from the acting. But still thinking has to be related to concrete material; the child cannot, as it were, operate with symbols only. The child has at his command a coherent and integrated cognitive system with which he organizes and manipulates the world around him (Flavell, op cit). This system has definite structural properties which are quite different from the simple connections earlier, characteristic for the phenomenon of juxtaposition.

The child is now able to conduct *cognitive operations* pose relations both asymetrical and symetrical and combine them to form new relations. This is of great importance for mathematics, in which Piaget believes one can find true logic, a central aspect of intellectual operations.

One characteristic of concrete thinking is *reversibility*. To think in a reversible way means to understand that the same action can be carried out in both directions, while it is still the same action being dealt with. If a line of marbles in different colours are put into a tunnel, the child will now be able to tell which marble comes first even if the direction is reversed in the tunnel. Another example would be that the child now understands that there is the same amount of liquid whatever the form of the container might be.

Classification is now possible on a more advanced or abstract level than previously. The child has now a generalized ability to pose other classes, to add various classes together to get a supraordinate class, and also to subtract classes from a supraordinate etc. The child understands the relativity of classification, which means that the same object can be classified differently, depending on the basis for classification.

Another characteristic is *conservation*, which means that an object or phenomenon remains the same although it changes its external qualities. The child knows, for instance, that it is the same piece of clay whatever the shape of the piece. The liquid experiment previously referred to is also a good example.

Seriation can now be carried out by the child on an à priori basis, while the younger child is only able to make a seriation after measuring or trial and error. The child is now capable of making a seriation of a group of objects with regard to size, dimension, volume, colour etc.

Many of these notions characterizing concrete operational thinking are based on a condition of a *holistic* view by the child, where many factors can be taken into consideration:

> *... the isolated operation can never be the proper unit of analysis, because it gains all its meaning from the system of which it is a part.*
> *(Flavell, op cit, p. 167)*

This means with regard to all notions being described in relation to concrete operational thinking e.g. conservation, seriation, classification etc, that the whole has to be taken into consideration for solving a task. The child is now also able to decentre himself from the object.

2.1.2.4 The stage of formal operational thinking

Piaget calls the fourth level of thinking the formal operational stage (11 years upwards). It will only be mentioned briefly here since, like the sensory-motor stage, it has no implications for this investigation. On this level the child is able to operate with symbols only which do not have to correspond with, concrete reality as at previous levels. The child is now able to erect *hypotheses* which he is then able to prove or verify. He can now think and *reflect about his own thinking*, construct ideals and imagine situations which have no correspondence in reality. It is once again the meta-level which is the focus of this study, a point which will be returned to. The teenager is now also able to keep his thoughts to himself in contrast to the younger child who does not have this skill. This is, according to Piaget, the highest level of thinking where abstractness and symbolization have separated most from concrete reality.

2.1.3 Some further elements of the Piagetian theory of development

Piaget's methodological approach will be described later. What is of interest to stress further here is how the theory is built on different levels of thinking. Piaget began his research by interviewing children to find out their conceptions of the world around them. This is perhaps the most important thing he has done, to take interest in children's way of thinking and prove that they are not bad thinkers, but completely logical in their thinking within their own frame of reference. Children think differently from grown-ups, but not poorly (Piaget, 1975).

Subsequently, most of Piaget's empirical work was built on a combination of experiment and interview. Not all of Piaget's theory is empirically discovered; there are also logically possible cognitive structures described (Flavel, op cit). This means that out of the child's way of solving a task or acting in a particular way, Piaget makes emphatic inference about how the child must have perceived the world. Let us look at some of his earliest studies of importance in relation to this investigation. These studies are of interest because they represent a similar approach to a defined content as the present study. Two examples will be given here, namely, children's conceptions of thoughts and children's conceptions of dreams (Piaget, 1975).

When asking children, "What do you think with?", Piaget obtained answers which could be described in three distinct categories. During the *first stage* children believe that thinking is "with the mouth". Thought is identified with the voice: when one stops talking, one stops thinking. At the *second stage*, thinking is with the head, but remains materialized. It is like a voice inside the head, which is made of air, blood etc. At the *third stage*, children understand that thought is a process in the brain, which cannot be materialized in any way.

The same distinct categories were found when he talked with children about dreams. The question was "Where do the dreams come from?". During the *first stage*, children believe dreams come from outside and also take place within the space of the room. One dreams with one's eyes. At the *second stage*, the child supposes the source of the dream is in the head, in thoughts, in the voice etc, but the dream is in space, in front of him. One dreams with the eyes just as one looks at a picture outside. Finally, at the *third stage*, the dream is a product of thoughts, a process which goes on in one's head.

We can see close similiarities in these stages of conceptions of phenomena like dreams and thoughts. Dreams as well as thoughts are activities occurring in the child's surroundings, and happening separated from him, in the materialized world. The next conception is related to the child but is still a materialized phenomenon. The child is now aware about his own involvement, but only to a limited extent. Finally, the child becomes aware of his total involvement; it is seen as an abstract process going on within the child. Children's conceptions of thoughts and dreams are both examples of phenomena which develop from being external to being internal in the child. This means that the child becomes more and more aware of his own role in actions.

2.1.4 Criticism

There are at present many projects under way which aim at applying or extending Piaget's theory. At the same time, many critical voices have been raised. One of the outstanding criticisms is of the general or universal stages described by Piaget. Current research points more towards a universality at the earliest age levels, which then becomes more and more differentiated; this entailing that culture means more for the way of thinking, the older the child becomes (Flavell, 1977). Flavell's description of the stages assumes that there is a capability for all behaviours which reflects a stage at the moment of transition, but the actual application of this capability to various problems takes time to unfold. Thus, there is a gradual increase in the number of, for example, concrete operational actions, until a point is reached when all actions reflect concrete operations. This means that the stages overlap and context must be taken into consideration. New stages begin to develop before the previous stage is completed (ibid). Children go through these stages in every area and consequently they can be at different levels according to how familiar they are with the area worked with (Feldman, 1980).

Piaget's view of development as universal (in the sense that a child has a capacity to think according to the stage he is at) is a standpoint which is heavily criticized. The same child can give expressions of being at different stages depending on the content or context (Donaldson, 1978, Marton, 1981b).

Donaldson (op cit) believes that we have underestimated children's possibilities of understanding and responding due to Piaget's theory. She uses some of Piaget's tests, but uses a *context which is familiar to the child.*In 90 % of the answers, they were correct at an age level at which children according to Piaget should not be able to succeed. Children are, thus able to make inferences about everyday experience or familiar situations which were thought far beyond their capacity. She also shows that children do not try to find out the meaning of specific words, but the general meaning of the questions they have been asked. This means that the child answers what he interprets as the question: not the words as such, but the words in a context, in a relationship with something. Egocentrism is, according to Piaget, one of the reasons for a child not to come to proper conclusions in different situations, but Donaldson thinks that there is less of a difference between a child and an adult in this respect. The critical point is to ask children questions which are entirely comprehensible and make sense to them. This she thinks Piaget gives as little attention to as the social context with which the child is always surrounded. Although Piaget indicates the social context as a necessary and important factor in development, he has been criticized for not taking it into consideration more explicitly in his theory.

Hundeide (1977) points to the social context in which the child operates and elaborates the thesis that we have to understand the premises of the answer for the child in the situation, not as a follow-up of a structure within the child, but as a follow-up of the way the child understands the question as well as the situation he is in. This means that the child's problem in an experimental situation or in a pedagogical setting has to be looked at from the *pre-understanding* which the child has. Hundeide stresses the importance of the child's own *self-conceptualization* as a factor involved in motivation and others' expectations. To interpret the child's way of thinking we have to consider not only the experiences which the child has had, but also the social setting and the questions asked, in order to obtain a more valid picture of the child's way of thinking.

Haung (1930) criticizes the Piagetian view of the child's heavy dependence on his perception, and shows in a series of experiments how children relied on previous knowledge or established beliefs to explain strange phenomena. But he also points out that, when it comes to new phenomena where the child has no knowledge or beliefs, he will rely to a large extent on his perception.

To conclude this section on Piaget-criticism, we would like to point out that the most important issue raised concerns the universality of stages. It seems now generally accepted that the same child may have advanced to different levels of development within different domains in accordance with his specific experiences of those domains.

2.2 Heinz Werner

Werner sees development in a wider sense than Piaget: namely as a *variation* between age levels, between cultures,or between mental states. He makes a comparison between different cultures, modern technological Western society and primitive natural societies which are to a large extent separated from influence from outside.

As a consequence of this cultural comparison one of his conclusions is that the logic of thinking in Western countries is only one of many possible varieties. Werner also compares the child's thinking with the illiterate adult's thinking (which, by the way, was labelled *primitive mentality*). In comparing children and illiterate adults, he points not only to fundamental differences, but also to similarities in development. The child is a growing unstable organism, progressing from his own world of thoughts toward the adult way of thinking. This means that social patterns are vaguely organized and the child is trying to arrange his thoughts according to an inadequate and unorganized world. The illiterate man's behaviour is fully developed and fixed in traditions continuing over a long period of time. It means that the world of man in an illiterate culture is permanent and stable with a clear connection to a socially well-organized milieu, while the child's thinking is vague and changable (for further comparison, see Werner, 1973, p. 26). If we look at a child in an illiterate culture and in Western countries, it could be said that the "Western" child is faced with a larger demand of flexibility with regard to qualitative formability as well as to the degree of formability.

One of the main ideas in Werner's theory is seeing development as a progressive differentiation and integration of thinking, which results in a wider flexibility in mental processes. The *orthogenetic principle* in Werner's view of development implies an increasing differentiation of the components in the symbolic situation and also as an integrative systematization of the symbolic forms (Barton & Franklin, 1978).

Thus, for the child, the world is an *undistinguished whole* in many ways. Reality is a totality. The child does not distinguish between different situations during its day, so that "serious" activity and play do not exist as two aspects of reality. By comparing the illiterate man's mental states and the child's thinking, we can see how these two aspects, "work" and play,are closely related in the illiterate man's world as well. Another aspect of the undistinguished whole is how children first perceive the whole before being able to distinguish the parts. This means that the child perceives reality in global terms. For example, one may cite the young child who is able to tell what he sees in a picture, but is not able to distinguish between its components. According to Werner, this represents an organic holistic form of understanding, where the parts are dependent on the context or on the whole of which they are part. There are two processes behind the increase in differentiation and integration. One is a process of quantitative change which can be gradual or abrupt. The other is a qualitative change which is by nature not continuous.

The illiterate man and the child live in a realistic, concrete world of thoughts, where phenomena that are closely related constitute a whole. The young child uses one notion for a group of related phenomena when beginning to speak. This can be seen in terms of seeing reality as a whole. We can also see how the illiterate man deals with closely related phenomena in terms of the same notion, for instance, fire and wood or glass and water are defined as one notion.

The world of the young child is *physiognomic* (physically characterized). with a total absence of polarisation. Instead there is an amalgamation of person-thing, subject-object. Differentiation develops not only in the area of cognition but also in emotions and motor activities. The nuances of feelings develop from sorrow, excitement and joy, just differentiation of movement goes from moving the arm in a particular direction before moving fingers etc (Werner, op cit). Werner indicates how perceptions are closely linked with emotional and motor behaviour in the child. Emotions play an important role in conceptualizing and memory representation.

The child's world is a world of actions, where the objects are met from the point of view of "what can I use this for?". Situations are perceived from the function they have to the child. Let us take an example: if a child comes to the beach, this means for the youngest child that he perceives the sand and the stones since these are what will be used in making a sandcastle. At the next age of level, the child perceives space since he plays with a ball and runs around. And perhaps the teenager perceives the beach from the sunbather's point of view, since this is the purpose of his visit.

For the illiterate man and the child, the main aim of language is not to explain a thought but to play an active role in human acting. (Compare the view of Piaget which is similar for use of language by the child, se p.21) The structure of primitive thought is that it is concrete and closely related to the levels of perception and imagination. Reflection on this level always means concrete configuration. Explanations are descriptive and narrative, and always refer to concrete, familiar situations. Diffuse thoughts are constituted due to a lack of consistency and due to a consequent disequilibrium in relations. If we look at the general developmental change in the symbolic process,Werner says:

> *We must conceive the development of the naming functions as proceeding somewhat in this manner: Initially, the name is the physiognomic aspect of the thing or of a part of the thing. Gradually it becomes a picture of the thing (the word 'ball' so to speak can roll without being the ball itself). Later still this physiognomiy of the word appears as a mere 'diagram' or 'schema' by means of which the abstract idea is made visible and audible and thus represented. It is somewhat the same process as that involved when the idea of 'dog' is made visible and communicable by a drawing of a dog. This sensuous character of a representation can also be ultimately lost, so that nothing remains but the name as a sort of algebraic sign no longer felt simply 'known' as the symbol of the object.*
> *(Werner, 1973, p. 266)*

The developmental trend goes from labelling the name as a property of a thing towards abstract algebraic symbolization. (This is also a view comparable with the Piagetian, see p.21). The characteristic of the structure in the thought-process is described by Werner as expressed by two pairs of terms, flexible - rigid, and labile-stable. In general, the more differentiated and hierarchically organized the mental structure of an organism, the more flexible is its behaviour.

From Werner's point of view, a notion like learning would first be conceived as one particular situation, later to be differentiated into different components in the process of learning and also differentiated into different types of learning. A hierarchical pattern will also develop in which one kind of learning is subordinated to the other. Young children will not be able to differentiate notions which are closely situated in meaning, but as mental development progresses, they will distinguish between these words and notions. There will also be a hierarchy, which means that some notions are easier to understand than others.

The child's cognitive activity will, as it were, develop from one undistinguished whole to a world full of nuances, and also become more closely related to an integrated whole in the child's mental activity. It is all a question of learning to use and understand symbols.

> *The major entities in any symbolic act are the symbol itself, the person producing or comprehending it and the symbol's referent.*
> *(Flavell, 1977, p. 39)*

The young child participates in a communication, he shares an experience, rather than gives a message (e.g. a smile between the infant and his mother). Gradually it becomes a question of sharing symbols and of distinguishing between the referent and what it refers to.

2.3 Studies of metacognition

One of the most important frame of references for a study like this is the research tradition in the development of metacognition. Metacognition refers to an awareness of one's own cognitive actions. Almost every day is a new experience for children, giving them new acquisitions, skills or knowledge in the domain of cognition. During this learning process there is an ongoing metacognitive process, which means that children become aware of their acquisition of skills or knowledge. There is a *distinction between knowledge and the understanding of the fact that one possesses that knowledge.* The skills of metacognition are those attributed to the executive function in many theories of human memory and artificial intelligence: predicting, checking, monitoring, reality testing and coordination and control of deliberate attempts to study, learn or solve problems (Brown, 1978). Metacognition is, in other words, an additional level of cognition; i.e. cognition about cognition, thoughts about thoughts etc.

It is basically a way of making use of the thought-process in different situations. Intelligence, as well as memory, are involved in this development and vice versa. Since memory is seen as an important part of metacognition, most of the experiments and studies being done are in this field, perhaps also due to the fact that it is relatively easy to design experiments in which the variables in the field of memory can be conrtolled. Meta-memory refers to this intuitive knowledge and understanding of one's own memory. Perhaps the fundamental aspect of metamemory is the realization that there is a need to remember; that is, a young child must learn that situations exist in which memorization is called for and must also learn to discriminate these situations from those which do not demand memorization (Kail, 1979). This means that before children have realized the need to remember something, they will make no attempt at mnemonic strategies.

Flavell (1977) describes an experiment where he let children at different age levels memorize a series of pictures and where they were allowed to look at the pictures as long as they felt the need. The youngest children looked at the pictures the shortest length of time and were also the poorest reproducers. This shows that they have still no awareness of the importance of their own activity in relation to the result. In another experiment, children were asked to predict which of the two children they thought knew most, the one who studied for one minute or the one who studied for five minutes. Most children predicted that studying for five minutes is a better strategy, but children below third grade (i.e. 9 years old) were less able to justify their choice. In addition, children do not always indicate that they would study for five minutes themselves, even if they indicate that the longer time is better (Brown, 1978).

With respect to the child's realism in relation to prediction it is not unimportant what it is the child makes the judgement about. Markman (1973) found that five-year-old children could predict whether they could jump various distances or not, better than predict their ability to make recalls. It is, in other words, *easier for children to make predictions in a realistic way about a behaviour than about their mental activities.* When a child becomes aware that he has understood something or not, progress in metacognitive knowledge has been attained. This means that young children take for granted that they have understood everything, to the extent that they are aware of the "understanding aspect" of their daily life at all, in a similar way that they take for granted that other people understand everything they say. According to Piaget, this is due to the child's egocentric way of thinking, the lack of understanding of another person's perspective (Piaget, 1975).

In a learning situation, it is important to be aware whether you understand or not. For a child to be able to instruct someone else about a game or a trick, he must have understood the game or instructions himself. Markman (1977) instructed children between 6:2-8:6 years verbally about a game, and demonstrated and verbalized a magic trick where he left out important parts which made it impossible to understand what the child should do. When the latter asked questions to understand better, Markman took it as a proof of the child's awareness of not understanding everything, i.e. the child had realized that he did not understand. The results clearly indicate that older children realize that the information is incomplete before younger children do. Younger children have to be induced to repeat an instruction, or even to execute it, before they realize anything is wrong. These younger children failed to execute the instructions mentally, and consequently did not notice the problems. The magic trick which had been demonstrated also made the younger children aware of their own lack of understanding since the demonstration of the task could have served as a partial substitute for the mental process. The child did not have to infer mentally the results of applying each transformation, since he had previously seen some of them enacted. This experiment shows how children are able to make meta-reflections about manual skills (doing) at an earlier level than about mental skills (knowing).

Miller and Bigi (1979) carried out a study to find out children's understanding of attention: how the concept of attention develops. Open-ended as well as multiple-choice questions were used. Children participating were in grades 1, 3 and 5. Most children offered a definition of "paying attention" like listening. Reasons for problems in paying attention decreased with age, from emphasis on noise level as a determinant of attention to an increasing emphasis on psychological factors such as motivation, mental involvement and possible distraction. Miller and Bigi maintain that the way in which attention is conceptualized has implications not only for carrying on a conversation effectively, but for the child if he is teaching something to another child; he must be able to infer that the second child is interested or bored, and know what variables affect the second child's attention.

In yet another study by Cauley and Murray (1982), children were asked about the explanation of school success and failure. Children in grades 2 and 3, had to define these concepts, then there was a discussion about their own success or failure, and about younger and older children's ability and effort in success and failure at school. It was obvious that children believed or imagined they were more likely to succeed if they tried harder than if they were older and knew more. Hard work or effort means more to success than the use of knowledge or ability with respect to 7-10 year old children.

Flavell (1977) shows that there are three major variables involved in metacognitive knowledge, namely, person, task and strategy. The *person category* includes everything you believe about the nature of yourself and other people as cognitive processors. The *task category* concerns the information available to you during cognitive enterprise and the *strategy category* refers to the knowledge about what kind of strategy would be most effective in what sort of cogntive undertakings. Flavell also says that metacognitive experiences are most likely to occur in situations that stimulate a lot of careful, highly conscious thinking.

Some issues within the studies of metacognition which are of great importance are *knowing when you know, knowing what you know and knowing what you need to know.* If a child knows that he knows something, it refers to a self-awareness in the realization that there are things you know and things you do not know. Knowing what you know refers to the awareness of having something in your mind, which perhaps you are not able to voice just at that moment. Brown (1980) talks about the tip-of-the-tongue phenomenon as a sign of knowing what you know.

> *It is not until the mid-grade-school years that young children can reliably indicate a distinction between what they know but cannot retrieve and what they do not know.*
> *(ibid, p. 459)*

Knowing what you need to know is the basis for many problem-solving situations. As long as you are not aware about what you need to know, you will most likely not make strategic moves to solve the problem properly. Apparently this is a real problem, since under 7 years of age there is evidence that situations that require deliberate attempts to remember and those that do not are not clearly distinguished by the child (Brown, 1975).

Let us examine a particular subject-matter in school, namely, reading and writing in relation to metacognition. One of the main findings in reading and writing disabilities, according to Lundberg (1983) seems to be a lack of linguistic awareness. Different investigations have shown how linguistic awareness is of critical importance for reading and writing learning (Lundberg, 1978, Lundberg, Olofsson and Wall, 1980). These studies have also revealed how the measurement of development level of linguistic awareness in pre-school can be a good predictor of children's success or failure in primary school. Lundberg (op cit) states further that behind linguistic awareness there is a more general metacogntive skill, which refers to one's own learning abilities. Reading and writing problems seem to be closely related to the child's own self-concept and consequently there seems to be an important relation between self-concept and metacognitive abilities.

Metacognitive skills are context-related to a large extent. It is not always a question of how old you are but how much you have experienced in a particular cognitive domain (Brown, 1980). Most research carried out on metacognition is in experimental settings, sometimes far from the everyday life of a child. Most likely, in this area as in the area of memory, children are able to remember lists of words, less than if the words were embedded in a meaningful activity (Istomina, 1975).

The above constitute a limited selection of studies carried out within the field of metacognition. Many of these studies are of an experimental character separating, them from the empirical part of this thesis where the child's everyday experiences are taken into consideration. From these studies we can see how the child seems to be aware of, and able to reflect about manual activities earlier than he is aware of, and able to reflect about his mental activities, whether it is in relation to remembering or knowing in general. If a young child has not grasped a part of an instruction he will not realize it until he repeats or executes the instructions. The last aspect of metacognition in relation to these studies will be to point out the contextualities and to stress what was shown by Kail (1979): that a child will make no attempt at mnemonic strategies before he is aware of what it means to remember. This may be seen as if awareness of a means to achieve an end must be preceded by awareness of the fact that this end exists.

In summarizing the three different views of development accounted for briefly in this chapter one could say that they all, in one way or another, deal with the child's consciousness about the world around him. They all represent a hierarchical structure progressing from the child's concrete actions to symbolic activity. Symbolization is not separated from acting for the young child, while this separation becomes obvious with increasing age. These views of development have to be seen as a general development of the child's way of thinking and awareness as a whole. We will now go further and describe the frame of reference in previous research in relation to the phenomenon of learning.

3 THE EXPERIENCE OF LEARNING

The aim of this chapter is do describe the approach to the study of learning developed by the INOM research group during a ten years period. This group has been the intellectual context in which the present study was carried out. The historical development will be mentioned briefly. Three kinds of results of specific relevance for the present study will be accounted for: differences in approaches to learning found among students, differences in conceptions of learning found among adults and differences in thinking about reading found among children. We will finish with a discussion of the educational implications of the view of learning proposed here.

3.1 An approach to the study of learning

Theoretical systems for the interpretation of learning have arisen along with the experimental study of learning. Although experimental ideas come from everyday problems, they are often distanced to such an extent that the original problems become barely recognizable (Hill, 1980). Experimental settings are also the most common way to approach children's learning (Stevenson, 1972).

In most research about learning, it is the teacher, researcher or someone else who defines what it means to learn something. Learning is explained or described as an objective process or as results, measured from the outside. The question raised when evaluating learning has focused attention on *how much* the subject has learnt. One could say that this perspective has, and still dominates education on all levels. This can be seen in examinations which are often designed as numbers of right and wrong answers.

As a reaction against the traditional, and often from the subjects' point of view, meaningless rote learning which was the standard focus of research, a project called TIPS (Tillämpad Inlärningspsykologi och Studiefärdighet/Applied psychology of learning and study skills) was initiated. The starting-point of the investigation was that, in many learning situations, what is central is not facts, terms or signs to be learnt by heart, but the understanding of a message or an idea about the world around us, via texts or symbols, i.e. symbols are tools by which one learns the nature of things. The project aimed at illuminating how to observe and describe knowledge; how to observe and describe study skills; and how to influence study skills (Marton, 1974).

Since learning is not one phenomenon but many, depending on what learning is about, the context has to be taken into consideration. Thus, learning has to be specified in the particular context it refers to. Learning is impossible to describe as a general phenomenon but as a phenomenon in a context, related to *what* one is expected to learn (Marton & Svensson, 1978).

As a consequence of taking the learner's perspective as a point of departure, everyday situations of learning have to be in focus. This means that the natural context has to be expressed. In the context of learning, learning is always about something, i.e. about a content which has also to be taken into consideration. It is true that the content is most apparent to the learner, but it is also true that if one asks an adult to reflect about the learning as such, he could make himself aware about his own relation to the learning situation.

The view proposed here is to define learning as a change in meaning, attitude or understanding of a phenomenon, principle or notion. Learning has taken place when a subject's conception of the content of the studied task has changed to a qualitatively more advanced level of understanding. This view of learning constitutes a background for this study. Before a change in these qualitatively different conceptions can be seen, they must be described; and in the next step this is an expression of how people think about the particular phenomenon.

Results of studies with such an approach have qualitatively different conceptions in focus. The aim is not to explain conceptions, *but to define and explore them.* In traditional research, questions concerning qualities should be dealt with in the exploratory phase of the research process, for later transformation into measuring instruments to be used in the main study (Marton & Svensson, op cit). Marton (1978) maintains that categories of description, i.e. categories in terms of which we can describe conceptions, should be recognized as results.

Before discussing some of the results arrived at within this research approach we will briefly comment on an earlier tradition which has been one of the sources of inspiration for the work done in our own research group.

The view of learning advocated by the school of Gestalt psychology is very similar to the one mentioned above. As Wertheimer, the "father" of this direction in psychology, used children for his research, one of his examples will be taken as an expression of the focus of his research, namely that of seeing learning in terms of a qualitative change in thinking. Wertheimer (1959) defines qualitative change as a product of productive thinking. He says:

> *There are fine cases. You can find them often, even in daily life. If you have had your eyes open, you have probably encountered somewhere in your life - if nowhere else, then in children - this surprising event, the birth of a genuine idea, of a productive development, the transition from a blind attitude to understanding in a productive process. If you have not been fortunate enough to experience it yourself, you may have encountered it in others; or you may - fascinated - have glimpsed it when reading good books. (p. 1)*

These "fine cases" are what Wertheimer believes are characteristic for the productive thinking necessary in meaningful learning and understanding. Perception plays an important role here; to learn means to see a new "gestalt" and to see a new "gestalt" means to be able to grasp the structure of a problem, since the parts of a problem constitue specific parts of a whole. To find a solution or solve a problem, one must be able to see the whole in a new way, to see a new "gestalt". This reconstruction also means that some parts get a new meaning in a new structure. To understand the structure, the source of the problem, entails seeing the internal relations.

In a social setting, this involves seeing the problem not only from your own point of view, but also from the perspectives of the other people involved; the problem will then acquire a new structure and new possibilities to solutions (ibid). If we apply this view to a situation of conflict between two young children, it means that one cannot teach children to solve a situation of conflict themselves, since they do not have the capacity to take each other's perspectives. This is something they have to learn from an adult who is willing to listen to both children and their perception of the conflict and guide them to see each other's perspective. Wertheimer states that, as adults, we often make the mistake of trying not to take the child's perspective e.g. in teaching. Let us look briefly at an example of his in which he follows a classroom teaching situation.

During the lesson, children learn to find out the area of a rectangle by seeing a the area as equal to the product of the two sides. The next step is to teach pupils the area of a parallelogram by extending two parallel lines from the two upper corners to the base line. The children now saw a rectangle whose area they were required to find (see figure 1a). These examples were repeated for various sizes of figure. The following day, when the teacher thought that everybody had grasped the idea, Wertheimer asked himself if these children had done any thinking at all. Doubting that they had, he went to the board and drew a figure of a parallelogram turned in a vertical direction (see figure 1b).

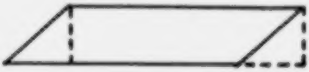

Figure 1a.

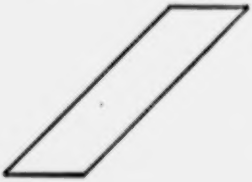

Figure 1b.

Wertheimer found four distinctly and qualitatively different types of reactions among children which he took as proof of different ways of thinking; *first type*, no reaction at all; *second type*, searched their memory intensively, to see if they could recall anything that might be of help; it was a blind search; *third type*, some tried to talk around the problem and analogous situations, or they classified it in some way, applied general terms, performed some assumptions, or engaged in aimless trials; *fourth type*, in a number of cases he could observe real thinking at work - in drawings, in remarks, in thinking out loud (ibid, p. 45).

Wertheimer considered that this experiment showed that the children were not forced to think, but only to apply a model shown by the teacher. The teacher had not realized that the child had not grasped the problem since she never tried to find out his thinking. Werthiemer also shows that it *does* happen that children even as young as six, who have learnt nothing of geometry, after being shown briefly how to find the area of the rectangle, *do* produce the solution for the parallelogram by an original process without being taught what to do. These cases represent what Wertheimer means by "real thinking". These children realize that something has to be done with the figure to change it into an area which can be seen clearer. (Children at this early age used concrete material, paper and scissors,as an aid for their real thinking.) This example of Wertheimer's illustrates the research approach in which focus is on qualitatively different ways of thinking as an outcome of learning.

Let us now go back and underline two of the main points of the approach suggested which are specifically relevant for the present study:

a) learning should be described in terms of its content (see e.g. Marton, 1974) and

b) learning should be described from the learner's point of view.

3.2 Approaches to learning

Two distinctively different ways of approaching learning tasks were found among students, the *deep- and the surface approach*, respectively. The main difference seemed to concern how the student focuses his attention in reading a text. From this point of view, a *surface* approach means that the student has directed his intentions towards *the text as such*. Focus in this approach to learning is on understanding the words, the parts of the content of the text, which means that the sequences of parts in isolation have to be memorized. The student also describes himself as playing a passive role in the learning process. Svensson (1976) describes the surface approach as an *atomistic* orientation of the student, which means that the whole of a text is seen as a sum of the parts, and attention is aimed at memorizing the text.

The other way of setting about a learning task is what has been called the *deep* approach. This means that the learners' attention is focused on *what the text is about*, where the learner looks for the meaning of the text in relations between its parts, as well as between the content and the world around him. The student finds himself an active agent of his own learning, i.e. he is the one who creates learning, (Marton, op cit). Svensson's (op cit) view of this approach to learning is labeled *holistic* orientation: *the intentional whole* of the message is taken into consideration for understanding.

One could point out the main difference of approach to learning as a dichotomy between attending the sign (text) on the one hand, and attending an understanding of reality as it is signified in the text on the other. How the student approaches the learning situation is not a quality of the student, but a definition by the student of the demands or situation involved in. It is, in other words, a result of how the student defines *what* to learn (Laurillard, 1979).

Learning has been seen here as approaches or levels of processing, but learning can also be seen as levels of outcime in terms of qualitatively different conceptions. Marton and Säljö's (1976) examples of how students recalled a text about individual and social consequences of school "drop-outs" will illustrate levels of outcome here:

Category A: subjects were *conclusion-oriented* and commented on the causes and consequences of the problem.

Category B: subjects *described* what the author said without including causes, consequences or conclusions.

Category C: subjects treated the topic only very superficially and merely *mentioned* the topic that the author had discussed.

The above examples of levels of outcome are very general and may be applied to a broad range of problems. This is not so, however, in most of studies carried out by the Gothenburg research group; since the content is the focus of analysis, most conceptions classified as outcome are very specific. Since the learner's point of view is one of the bases of the present approach, students' conceptions of the studied phenomena must be examined.

3.3 Conceptions of learning

As professionals in the field of learning, students have been experimental subjects in most of the studies carried out in the INOM-group.

Widening the population from which the subjects were selected, Säljö (1979a) asked the question "What do you actually mean by learning?" to three groups of young and adult people with a background of 6-9 years, 12 years and finally more than 14 years of formal education and found five different conceptions of learning.

1. Learning as the increase of knowledge
   Common for conceptions in this category is the idea that learning is the activity by means of which you add to your previous knowledge but no further specification is given to the nature of knowledge or to characteristics of the activity of learning. This represents a quantitative view of learning.

2. Learning as memorising
   The meaning of learning is to transfer units of information or pieces of knowledge from an external source, such as a teacher or a book, into the brain.

3. Learning as the acquisition of facts, procedures etc which can be retained and/or used in practice
   In this category the element of value or usefulness in practice is the main difference from previous conceptions. There exists a body of knowledge which the learner should attempt to memorize since it is valuable.

4. Learning as the abstraction of meaning
   Learning is not conceived of as an activity of reproducing but instead as a process of abstracting meaning from what is read and heard. It implies a different relation to the learning material in the sense that learning is a process where the learner actively selects and condenses ideas, principles, procedures etc which are to be learnt and understood.

5. Learning as an interpretative process aimed at the understanding of reality
   This conception of learning is equal to the previous category, but there is the added emphasis that an essential element of learning is that what you learn should help you to interpret the reality in which you live.
   (Säljö, op cit, p. 12-17)

We could say that the main difference, according to the conceptions characterised by categories 1-3, is that knowledge exists "out there" in books, lectures etc, while categories 4 and 5 refer to conceptions according to which knowledge takes place within a person. Säljö (1979b) states that conceptions reflect differences in awareness about learning. He describes the development of the awareness of the phenomenon of learning, as going from a state of "taken-for-granted" perspective to a thematic perspective involving an awareness of various aspects of the phenomena of learning and its contexts.

In another study by Dahlgren & Pramling (1981), seventy university students from four different disciplines (medicine, technology, economics and psychology) were asked "What would you consider as knowledge?". Three main perspectives were found, dealing in different ways with the relation between (theoretical) knowledge and reality.

A. Knowledge is in some sense autonomous and separated from reality
   This conception reflects knowledge as existing as such, not always in relation to reality. It is often described as basics or facts which have to be learnt.

B. Knowledge is in a sense the application of (theoretical) knowledge to reality
   The central focus in this conception is the use of knowledge in activities in reality. Theoretical knowledge is, so to speak, the basis of practical preparedness for action. This means that students' perspective is such that one does not have any real knowledge if one cannot apply it in practice.

C. The relation between theory and reality can be characterised as an integration where theoretical knowledge is knowledge about reality
   Knowledge is considered as a way to deal with reality. Knowledge is knowledge about reality and implies that you have to understand the phenomena.
   (ibid p. 14-15)

The same group of students were asked: "How would you go about learning something?". Three different categories of conceptions were also found here. They corresponded to the view of knowledge described earlier in an obvious way.

A. Reproduction, which means that there is a body of knowledge which you have to memorize.

B. Preparedness for acting. There is a body of knowledge here as well, but there is a value in memorizing it, since you are supposed to apply your knowledge in practical action. The theory gives you the tools for acting.

C. Creating an understanding. There is no knowledge as such, but it is created in the relation between the learner and the object being learnt. It can be described as a process within a learner.
   (ibid p. 18-20)

Student's conceptions of knowledge and learning seem to correspond and be related to each other. If knowledge is conceptualized as a body of facts, it seems obvious that one has to reproduce and memorize to be the owner of that knowledge. In the next step, if knowledge is conceptualized as the basis of practice, it seems logical to think in terms of application in a learning situation. Finally, if knowledge is conceptualized as a creative process within the person, one has to look for understanding during learning.

Conceptions go from a reproducing, technical view towards an active view in which understanding has to be created by the learner. It reflects an active-passive dimension which is connected to other results. We can also see here an agreement between perceiving learning as preparedness for acting above, and the third conception of Säljö's (see p. 37) where acquisition of facts etc, should be used in practice.

Perry (1970) carried out an interview study with college students about their view of knowledge during their years at college. He found qualitatively differing conceptions of knowledge, which can be summarized in three main categories. An *absolutistic* conception of knowledge, where knowledge is considered as a body of truth about the world on which education should be focused. This means that knowledge was seen in terms of right and wrong. Another conception can be characterized as *relativistic*, meaning that students are aware of how phenomena in the world can be considered from different perspectives. The third category constitutes a relativistic view of knowledge but contains an *individual commitment*. The developmental trend during education was from an absolutistic view towards relativism and then to an individual commitment. Perhaps those students who leave their education unsatisfied, with a feeling of not having learnt anything, are those who never reach individual commitment. (Of course, an educational course can be bad in that it does not offer students opportunities to progress through these stages.)

Säljö (1982) has recently examined adult learners' conceptions of learning and the relation to the outcome of learning, where he very carefully describes the relation between how students perceive the learning situation and what emerges as a result of a learning task. Säljö thinks that a "meta-contract" guides how to approach the text as well as understanding of the text. Six subjects constituted examples (of a group of ninety in the whole data material). They had a background of various lengths of time in formal education. The design of the study was a learning task combined with interview, varying between general phenomena such as learning, knowledge etc, and questions about the learning material students had to read. Students had to talk about the content as well as their own way of dealing with the text when trying to learn it. There was also a concluding interview where they talked about their experience of learning in this particular situation as opposed to real life. The subjects had also to take two standardized tests.

Again, Säljö was able to discern two different groups of subjects. One operated on a surface level, trying passively to remember the text, looking at the content as parts in sequence. This means that the *pieces* of the text were understood by the students. The other group operated on a deep level, being active and creating the meaning behind the text, looking for the *essential*. Säljö, question by question, builds up a picture of how subjects with a notion of learning as a memorizing of facts approach the text on a surface level, so that, in the next step, they have difficulty in grasping the point and understanding the main ideas in the text. On the other hand, subjects with a notion of learning as a creative process, where meaning is reconstructed and refers to the reality which the text deals with, approach the text on a deep level, and are also better at understanding and grasping the point. These different ways of approaching a learning situation are based on different taking-for-granteds or different "meta-contracts" about learning.

An individual's "meta-contract" is explicable more in terms of his earlier experiences of learning than in terms of the capacity of the subject. Säljö also proposes that our educational system directs students towards a surface approach to learning. Students who are able to deal with learning through *deeper understanding* are those who have been exposed to another system of learning (e.g. a university). This means that, within a culture, we create notions of learning which have implications for our on-going life. Our educational system develops students towards a surface orientation to the phenomenon of learning.

> *Exposing generations of young people to 'learning' experiences of this kind, of course, is also a form of cognitive socialisation which has direct consequences for our well-being and for the possibilities we have of participating as active citizens in society.*
> *(ibid, p. 197)*

The characteristic of learning as it is described by the INOM-group and exemplified in this chapter is that there is no distinction between learning and development. These two aspects of growth run into eachother in the way that learning is development. The experience of learning described so far deals with adult perspectives: the child's experience will now be dealt with.

3.4 Children's ideas of reading

What does learning look like from a child's point of view? An area of great interest in children's life is when they start their formal education and are expected to learn to read and write. We will briefly describe here two studies about reading from the child's point of view (Ahlberg, 1981; Dahlgren-Olsson, 1980) These two studies presuppose that children's conceptions of what they are going to learn have implications for the learning itself. Dahlgren and Olsson's study deals with the why, what, and how of reading as it is represented in children's minds at the age of 4-7 years. It is obvious that learning to read is connected with school and does not suddenly emerge from a motivation from the child himself, but from grown-ups such as teachers or parents. The reason for reading was conceived by most as something useful in the distant future;a smaller group saw a use now; while a limited group of children could find no reason for learning to read however much they tried. Almost every child had an idea how to go about reading, but there was a distinct difference between pre-school children and children who were already involved in reading in primary-school. The younger children had a concrete anchoring in describing reading e.g. "one says the letters". "one thinks with the brain what it says - one blocks letters - then one hears it in one's ears". Primary school children have appropriated the rules of the school and talk about "sounding" the letters together in words. Their view represents a mechanical process without context. Hardly anyone talks about the meaning or content of what has been read. The purpose of reading and writing as a process of communication has, in other words, to a large extent got lost in the child's way of thinking about it (Dahlgren & Olsson, 1983).

Ahlberg (op cit) followed a group of children during their first school-grade and asked them questions about reading. At the start of school she found qualitatively different ways of perceiving reading, progressing from unawareness about letters, words or any meaning in the text, to an increasing awareness of a meaning as represented in the text. She also tested these children in reading ability and found that the children who had no idea of what reading was about when they began school, could not manage to read as well as other children at the end of first grade. This study shows a relation in a specific area between conception and the result of a phenomenon like reading; it seems, in other words, that if the child finds no meaning or motivation in reading he is most likely not to learn it.

Another interesting study by Ashton-Warner (1963) describes her ideas and practical work with Maori children (tribes in New Zealand) in getting them to read and write. She maintains that teaching these children to read and write is a question of conducting them from one culture to another. Since reading and writing are media of communication, this is the main idea the child has to grasp. Reading and writing have to be based on a meta-level of learning, which means that the child has to understand the value or idea behind it. Her critique of teaching in general is that in teaching which deals with words or messages which mean nothing to the child, reading becomes undesirable. Ashton-Warner says that the teacher has to find words that are important to the child to conduct him to the culture of reading and writing, since it is through important words that the child realizes that reading can be of importance to himself. The words she talks about are organic in character, they have to be words which are emotionally imbued and well-known (for Maori children such words were mainly about sex and fear); such words can, however, vary between cultures , within the culture, and within a group of children. The idea behind Ulrika Leimar's (1974) reading method LTG (läsning på talets grund/Language Experience Approach), is also to get children to understand the relation between spoken and the written language.

3.5 The educational implications of a view of learning

It is of great value for teaching if we can find out and describe children's as well as grown-ups' conceptions of learning in various situations and contents. Students come to a learning situation with different experiences of learning, as well as of the content they have to deal with. With the assumption of a hierarchical development of notions of various phenomena in the world around us, the goal of education ought to be to help students to reach these higher levels of understanding. But to help students with a specific notion one has to know what that particular notion develops towards. Feldman (op cit), shows that what is common for early prodigious children with regard to the learning. But to help students with a specific notion, one has to know towards what that particular notion develops. Feldman (op cit) shows that what is common for prodigious children with regard to the learning situation in which they are involved is that, not only do they have extraordinary teachers, experts that are extremely competent in their area, but they are also taught in terms of methods from a developmental view in that particular area. The child has to go through the development in the age of history that this particular knowledge has developed, and then get a feeling of being at the frontier of this domain. This means, according to Feldman (ibid), that education about a phenomenon should not be based on logic of the phenomenon as such, but on the development of knowledge in that field.

What we want to argue here is the necessity of taking the child's way of thinking seriously as a starting point in all kinds of education.

Piaget (1980) says, in trying to take the myth of mathematical ability away from a capacity of a child and turn it into the responsibility of the methodology by which the child enters the world of logic:

> *Something that is very surprising is the fact that everyone is convinced that to teach mathematics correctly it is enough to know it without having to be concerned with the way in which the ideas are established in the child's mind. (p. 97)*

There is often a dramatic gap between the teacher's way of thinking and the pupil's way of thinking. To guide the child to a better way of understanding demands an awareness of the child's way of thinking; in other words, the child will be "conducted" to answers, although there is really no understanding involved (Lundgren, 1972).

The research referred to has suggested that a person's conception of the situation has implications for what he thinks he has to learn and how he will do it. In our opinion, the kind of knowledge a child should meet in primary school and for which the child should be prepared in pre-school is what Wertheimer (see p. 34) calls *meaningful learning*. Learning must be a challenge for the child's mind. This means that the attitude, the idea of learning which must be presented to young children, should be as something meaningful. We know that young children like rhyme and doggerels, which perhaps can be seen as meaningless rote-learning, but we want to stress that these have their function for future learning to read (Lundberg, 1983). There is another kind of rote-learning which we are turning away from, namely the memorizing of words or notions which have no function or value for the child more than satisfying the teacher by giving right answers. Rote-learning and meaningful learning are distinctly different, which means that teaching dealing with one or the other has to be differently structured. This means that if we commit ourselves to meaningful learning for young children as well, we cannot organise learning as a rote learning situation. From this point of view it is extremly important to begin to look at learning in pre-school and primary school and see how children perceive these settings. *If we want to develop the child's way of thinking, we must begin with learning about how the child actually thinks.*

Before going further into the methodological implications for the possibilities of entering the child's way of thinking, we want to point out that the researcher also has a view of learning which subsequently underlies the line of reasoning in this thesis. The view of learning as a qualitative change in the student's or young child's conception of the world around which guides this thesis is a conception of learning which has also been found among subjects participating in the studies referred (Marton, 1982).

4 METHODOLOGICAL REFLECTIONS

The perspective or view of learning adopted in the previous chapter has implications for the research method which we will deal with in this chapter. We will describe in more general terms what the characteristics of this kind of approach entail, and outline more specifically the collection and analysis of data according to the phenomenographic approach. In the latter part of the chapter, attention will be paid to what is specific for this study, namely interviews with children and analysis of the transcripts. This chapter will conclude with a discussion of some differences between clinical interview methods and the interview method of the present study.

As research has to be judged in terms of its perspective on reality, the perspective adopted in this study must be explicitly elaborated. One could probably say that educational research is in the process of a shift in paradigm. The phenomena in focus for research today are of quite different type than some decades ago. It follows that the meaning of these phenomena has also changed. Educational research has previously focused on objectivity and experiments, while the trend today is towards inter-subjectivity and everyday experiences. The kind of research proposed here is a context-related one, which means that

> *Instead of focusing on discoveries of regularities one should seek to identify how the interaction of the different structures that are found are turned out in concrete contexts. (Marton, 1976, p. 6/Our translation)*

Thus this approach does not aim to verify theories or statements, but to generate new knowledge for the understanding of a phenomenon by the development of an explorative design.

The purpose of this study is to describe children's thoughts about the phenomenon of learning. From this point of view the method has to be of the character that the subject has to elaborate his thoughts. By exploring one's thoughts, one also exposes one's conceptions of various phenomena about the surrounding world. From this perspective, learning could be explained in terms of the learner's conceptions, while in most educational research learning is most frequently explained in the light of circumstances outside education. If success or failure in education is seen to be due to i.e. intelligence, political affiliations etc, educationalists cannot do much to change students' ways of thinking, since explanation depends on factors which education can only marginally influence. But if students' way of thinking are explained in terms of the context which it is part, opportunities arise to influence people's thinking in the educational system. Marton (1976) stresses

> *... what is necessary to study every phenomenon on its on conditions. The expression 'own conditions' refers to completely different things depending on what the phenomenon is. If the object of research is 'learning' or (more generally) 'reasoning' then one of the conditions is the content in question. The question how (you think for instance) should maybe be transformed into what (you think).*
> *(p. 9/Our translation)*

In relation to this study this means that the thinking of children has to be dealt with on its own conditions, in its own terms and in its own context.

As previously mentioned the context of research constitutes a base to be considered. The method has not to be justified in general terms, but in relation to a conception of the studied phenomenon, the conception at the beginning and the one reached via the contributions of the methods (Marton & Svensson, 1978). The guide-line in methodological terms is whether one reaches a comprehension of the studied phenomenon. This approach means that the subjects' ways of thinking have to be described in terms of *what* the thinking is about.

With the above attitude to research as a base, a new research domain has been developed by the Gothenburg research group (see some examples p.33). Ference Marton, the scientific leader of the group, has given the research tradition its name, phenomenography.

4.1 Phenomenography

Marton (1981) believes that there should be a fundamental distinction in research between what he calls *the first and the second order perspective*. First order perspective represents a description of various aspects of the world: an example might be the description of a child's situation during a day at school etc. Second order perspective represents the description of people's experience of various aspects of the world: an example might be the description of a child's experience of his situation during a day at school. The first order perspective is aimed at telling you how reality is, while the second order perspective is aimed at telling you how reality is experienced by people.

In this kind of approach, the explanation of the phenomenon is to be seen as *internal*, e.g. how someone conceives or thinks about the studied phenomenon. This perspective is quite distinct from the verifying approach where explanation of the phenomenon is looked for from an *external* point of view, i.e. external circumstances.

Internal explanation is exemplified in a study by Pramling (1983) where it was shown how the character of the acquired content and knowledge in education made academically-educated people think not only in different ways about reality in their first job, but also about relationships between education and work. It was also shown how people conceived of the world around them from an internal perspective, i.e. from the perspective of their own professional domain. This study shows how the character of the available knowledge within an educational course has effects on students,professional perspective. The purpose of phenomenography is to describe people's conceptions of the world around them in a systematized way. This means that *categories of description are the result of an approach like this*. It is important to realize that these categories of description are results, since this is also the base for this study. This means that if categories of description are not grasped or accepted as results, the results of this study will not be understood.

The categories of description of people's conceptions or understanding of reality are not seen as individual qualities but as denoting a kind of *collective intellect*.

> *... a structured pool of ideas, conceptions and believe underlying the possible interpretations (or possible constructions) of reality ...*
> *(Marton, 1981a, p. 98)*

These categories of description are similar to the "early work" done by Piaget, where he described qualitatively different ways of conceptualizing various aspects of reality such as time, number, speed etc. Piaget discovered similarities between conceptions empirically and also how conceptions varied in terms of qualitatively different ways of thinking about the studied phenomena. In his later work, Piaget changed his perspective and seemed to be more interested in characterizing general cognitive structures than in describing conceptions of specific phenomena (Marton, 1981b).

Piaget's two different perspectives refer to two distinctively different approaches to the study of thinking. These views of thinking mean that we either take logicality for granted and study understanding, or we assume understanding and make logicality the object of investigation (this dichotomy, is pointed out by Smedslund, and described in Marton, ibid). From this distinction between logicality and understanding, it can be said that the "early" Piaget took logicality for granted and was concerned about understanding, while the latter view dominated his later career. What Marton (ibid) argues for in relation to Piaget is:

> *He could have restricted himself to referring to the formal similarities simply as formal similarities, without stating that there is a common psychological entry underlying the various, formal similar concepts.*
> *(p. 164)*

Marton maintains that it could have been appropriate to find out conceptions of other phenomena and add further categories of descriptions to the ones introduced by Piaget. This kind of research is unfortunately very limited in extent (examples of this type of study are Damond, 1977 and Furth, 1979). This study will also be a contribution in this field.

Categories of conceptions can provide us with descriptions which can illuminate and give us a better understanding of people's thinking, even if these categories do not represent stable individual characteristics, but only ways of thinking i.e. ways in which individuals relate themselves to specific situations.

> *Conceptions often stand for the implicit, what needn't be said or what can't be said, since it has never been the object of reflection. They constitute the frame of reference within which we collect our knowledge or the basis on which we form our reasoning.*
> *(Marton & Svensson, 1978/Our translation)*

Further, according to Marton (1981a), reasons for this second order perspective research are two-fold:

> *Firstly - and most obviously - we consider that to find out the different ways in which people experience, interpret, understand, apprehend, perceive or conceptualise various aspects of reality is sufficiently interesting in itself, not least because of the pedagogical potentiality and necessity of the field of knowledge to be formed. Secondly, the descriptions we arrive at from the second order perspective are autonomous in the sense that they cannot be derived from descriptions arrived at from the first order perspective. (p. 178)*

The first and second order perspectives have to be seen as two complementary kinds of research, so that we get different kinds of knowledge according to which perspective is used.

4.2 Collection and analysis of data according to a phenomenographic approach

As indicated previously, the study of people's conceptions about a phenomenon necessitates allowing them to elaborate their thoughts and express their reflections or beliefs. The absolutely most important way to reach their conceptions is through verbalization. Although people have differing skills and abilities in verbalization,the interviewer always has the opportunity of checking or directing a question in another way to get a better understanding of what that person really means with his statements. The interview form suggested can be characterized as a dialogue where the interviewer also has to be active and interact by asking further questions formulated on the basis of the answers. Questions can be asked in various ways: they can be unstructured or structured, general or specific, etc, but it is important for the interviewer in the situation to get the subject to expose his conceptions to the extent that the subject is not able to or willing to explain his thoughts further. The interviewer must know what kinds of results to look for in terms of conceptions. This means that the interviews do not have to be standardized, but the aim of finding out conceptions of a particular phenomenon must be fixed.

The interview as a whole is taped and transcribed word by word. The transcribed interviews then constitute the material for analysis. The analysis takes place in the beginning by reading the material repetedly. This means that *all the interviews as a whole constitute a totality* where it is the impression or picture of all interviews which are in focus in this phase of the analysis. We do not work with individuals or cases; thus we disregard the single interview in favour of the totality. By reading the material repeatedly, particular statements appear as relevant for what is studied in this case, the conceptions of learning. The next step is to *compare statements* to see if these refer to the same conception, or to a qualitatively different one. When some idea of the variety of conceptions has been acquired,the interviews must be approached in a systematized way. In going through the material systematicaly, the picture of the whole is modified. This is a procedure which is repeated several times until one has grasped the *variation in terms of categories* which are to be found in that material.

In the process of interpreting and categorizing the answers, *the interview as a whole has to be considered.* This means that the separate answers must be understood in relation to the interview as a whole (Marton & Svensson, 1978).

After finding qualitatively differing conceptions about a phenomenon like e.g. learning, the next step is to describe these conceptions in different categories. The categories must be described as carefully and in as much detail as possible, because these descriptions constitute the basis of categorization not only for the researcher who analyses his own data, but also the basis for an independent judgement of the reliability of the results. When judging reliability, it is not a question of discovering the same categories but of being able to find the described categories in the material after instructions. The categories of description are usually characterized by means of a label and a careful definition of which meaning the category reflects. To make it possible for the reader to understand the relation between what the interviewees say and the category of description, interview quotations constitute examples.

The phenomenographic description of results in terms of categories represents a relation between empirical work and theory. Svensson & Theman (1983) say:

> *The categories of description represent the crucial relation between theory and empirical data. In a general form, they represent theoretical concepts and in the context of the specific case they represent empirical results. Thus, a category of description is used to clarify the relation between theory and empirical data.*
> *(p. 34)*

4.3 Execution and analysis of interviews with children

Interviews of various kinds have been used in research dealing with grown-ups for long time but this is not true for research on children. Since the interview as a method for collecting data among younger children is very rarely used,there is very little to be found written in this area.

This study can be seen as following a new direction in the phenomenographic tradition with regard to the age-group in focus. Let us look at what is special about the conducting of interviews with children and the analysis of the data.

Piaget was a pioneer in using interviews with young children as a research method. He developed this method after finding that observation was not enough to obtain an understanding of children's ways of thinking. As early as the 1920's, Piaget began with what he called the *clinical interview method.* This method is based on a developing interaction in a dialogue between the interviewer and the child. This is not an easy task. Piaget (1975) states that it took at least a year of daily practice before his own research assistants were apt at interviewing children in this way. Although the interview method is dependent on interaction between the interviewer and the child, the interviewer must know what he is looking for, without forcing the child into a preconceived pattern of response. There must be a balance between what is suggested to the child and the child being allowed to discourse aimlessly without sufficient direction (Damon, 1977). This means, according to Damon, that the interviewer must be flexible enough to allow for individual differences and, at the same time, standardized enough to permit comparison between children. The main aim is to adapt to the child's level of understanding and since this differs for children, the interviewer must be flexible enough to vary the questions in wording as well as in order, since children have different needs and peculiarities. The interviewer's task is to make sure that all the children have a comparable understanding of the questions that are being asked, although this comparable understanding can reflect different responses by the children, since it entails different phenomena to them at different levels of age.

It is also necessary in child interviews to have a *concrete experience* to talk about. There must, in other words, be a concrete content to talk around. Children cannot reflect about general phenomena, so the concrete examples talked about have to constitute the basis of a generalization made by the researcher. It is also obvious that having the same experience as a frame of reference when interviewing a child is an advantage. Not only is the same experience of importance, but also *a more general knowledge about the context within which the child is a part;* in this study this is the same as general knowledge about pre-school.

The *sensitivity* of the interviewer in getting the child to expose his thoughts is one aspect to be considered. The interviewer must be sensitive as to when to stop interviewing and how to raise the degree of difficulty in questions with increasing ability. Sensitivity also involves a technical aspect of interviewing, namely to arrange the interview so that alternating situations will take the child's attention, and also to keep eye contact and show a genuine interest.

It is also of great importance what kinds of question are directed to the child. A child is far better off giving descriptions and narrative answers than explaining something.

The more an interview acquires the character of a *dialogue*, the more willing the child will be to explore his thoughts, and vice versa; the more an interview has the character of questioning, the more inhibited will be the child's response. One of the keys of entering a dialogue with a child is to come as close as possible to the child's world; to be willing to let the child describe his world in his own terms. Most children will be willing to talk about their world if one is genuinely interested in what they have to say.

We would summarize the method of conducting child interviews by pointing out the concrete experience, the flexibility and sensitivity of the interviewer, and the kinds of questions being directed to the child, as being of a great importance for the child's response. The question technique can be seen as a tapered one, where the dialogue begins with a broad general question, and becomes progressively more specific.

If we look at what separates the analysis of a child interview from that of an adult, previously elaborated, we would like to point out that it is of even greater importance with a child than an adult that the interview as a whole must be taken into consideration when interpreting a particular phrase or statement. We would like to go even further and say that the interview as a whole is not always enough when analysing data of this kind,since children are not always as good at expressing themselves in as detailed a way as adults. To grasp what a child means exactly by a statement, you have to take into consideration all the knowledge you have about children in general, and child-development in particular. However, you must consider what you know about the situation that child is in, for example, where the interview is made, what was going on at that particular pre-school that day etc.

The way of interpreting child interviews described above may not seem to be in accordance with some of the basic tenets of phenomenology, or of phenomenography (as the latter is inspired by the former). In phenomenology,analysing means that one trys to place all that one knows about the world within a bracket during the analysis. The idea is to analyse the data in as unbiassed a way as possible. This seems to be contrary to what we are proposing in analysing child interviews. But what we mean is that the knowledge one has is always there within the bracket; it is only a question of disregarding one's knowledge for a while. We mean that the knowledge one has within the bracket, in terms of knowledge about the context and about developmental psychology is of a greater importance in analysing child interviews than it is in analysing adult interviews.

4.4 Methodological problems in using interviews of children in research

The reasons for not using interviews in the field of child psychology can be many, but Damon (1977) points out some which will be elaborated here. The first aspect concerns the traditional way of evaluating research according to the criteria of *validity and reliability*. It is not obvious how to apply these notions in this kind of approach but let us try. Piaget (1975) points out different types of answers in interviews with children that must be considered when talking about validity. Validity could be the interviewer's skill in "sifting the wheat from the chaff" i.e. interpreting which answers are the child's own genuine thoughts, and which are expressions of something else. What must be sorted out are those answers which constitute *romancing*; those *answers at random* which the child chooses because he is uninterested and wants to exit from the situation; and those answers that can be labeled *suggested convictions*, which means that the child answers to satisfy the interviewer. The genuine answers are what Piaget describes as *liberated convictions*, when the child is confronted with a new question which he has never met before, but after reflection from previous knowledge is able to give an answer which is his own. Genuine answers are also *spontaneous convictions* when the child has met the question before and is able to give a reflected answer.

If we look at reliability from the Piagetian point of view, one could say that reliability is guaranteed if there is an obvious pattern in the answers of a large group of children, and also for one child, if the pattern of answers is similar for different questions. To find out the reliability, the interviewer has to pose questions and counter-questions to get the child to expose his ideas.

A second problem in using child interviews is, according to Demond (op cit), *difficulties in interviewing children*. It is not an easy task to catch and retain the child's interest in a way that he becomes willing to cooperate, to create a relation for dialogue, and to create an interview-situation where the child feels at home and will not be disturbed by the environment etc. The contact one gets as an interviewer with the child in the beginning, and is able to keep during the interview, is an important determining factor for what emerges from the interview situation. Young children have not acquired the social roles which operate in an interview situation with older children or grown-ups. If something interesting distracts the young child, he will not be willing to continue the dialogue.

A third reason for the limited number of studies using interview as a method according to Damond (op cit) could be the *importance of language* in an interview situation. It is widely known that children are able to act before they are able to express themselves in language (Stevenson, 1972). This means that if you are interested in what children are able to do, you have to observe them, and see in what way they go about solving different tasks or approaching situations. There is not only a wide difference in children's capabilities of expressing themselves at different age-levels, but also a wide difference in children's understanding of a question. Anglin (1970) points out the growth of word meaning as inextricably linked to the growth of an aspect of consciousness. From Anglin's point of view, language should not constitute any problem in the child interview, since the capability to express oneself and consciousness follow close upon each other. Some research has been carried out to show that children during the pre-school years interpret mental terms with reference to external states, (Wellman & Johnsson, 1979). Children first interpret mental terms with respect to variable contexts of use. From such uses, children gradually acquire a more categorical understanding of the essentially mental features of the terms. There is also a tendency in sorting experiments that children are more idiosyncratic and categorize things in a way which can be called thematic (Anglin, op cit).

Another aspect with regard to language is the importance of the questions being asked (Pickert & Furth, 1980). Not only is the manner in which the question is asked of importance but also how the context of the problem is chosen. Dahlgren (1979) asked children between 6 and 12 years of age about the notion of price in relation to a bun, a bicycle and a diamond ring. The four qualitatively different categories he found were as follows:

A. Price is determined by the relationship between supply and demand for commodities.

B. Price is determined by the value of a commodity or the accumulated value of its constituents.

C. Price is determined by other properties of commodities than value such as taste, shape, size etc.

D. "Don't know" answers.

Answers varied with age, as well as with regard to the content of the notion of price. Conceptions also varied strikingly within a child depending on the context in which price was presented. A child could have a rather advanced conception of price in relation to one question, but was not able to transfer this conception to another question. For example, a child could use the (A) category, which means that they see the relation between demand and supply when talking about why a diamond ring costs more than a bike, while only use (B) category, which means the value, when talking about why a bun cost a particular price. One important aspect of children's interpretation of a question is their realistic way of thinking about various things around them. Realism, in Piagetian terms, means a form of lack of differentiation between the physical and psychological and, as a consequence, the child materializes psychological action, and looks at it as concretely physical and certain phenomena (Lindsjö & Rosén-Sverden, 1979). An example could be taken from the above study (Dahlgren, op cit) where a child could say that a bike costs more than a ball because the bike is bigger.

4.5 The phenomenographic and the clinical interview - some differences

The clinical interview method which Piaget developed is the same method used here, but the purpose is quite different. Piaget wanted to grasp the child's structure of thinking and for this purpose he used interviews to test questions to see if the child was able to give an appropriate response about how he dealt with the question or the task. Questions in natural science were in focus, to which there was always a correct answer. The problems or tasks with which the child was confronted were often far from the child's everyday life. In Piaget's questions there are a number of stumbling blocks. One could say that he, in a way, imposes upon the child, since he is often not concerned about children's conceptions as such, but about the general way of thinking which he finds behind the child's statements.

In this study the content is of central importance. The phenomena dealt with are not of the character where a correct answer could be found. We have seen how adults' conceptions of learning differ (see p. 37), and it is reasonable to expect this to be the case for children as well. Our point of departure is that the child should never feel that he fails, since we are genuinely interested in what the child says. We ask direct questions about what we are interested in and do not look for the thinking in general behind it. This is why the content of the notions being talked about acquire a more important place.

Säljö (1982) has shown in education how a conception about the learning situation or wider social reality guides people's way of dealing with it. From this point of view, it should be of a great value to look at some important conceptions of children in the context of pre-school.

One of the goals of the Swedish pre-school is concept-formation (see p.55) We suppose that the notion of learning is a concept-formation which plays an important role for many years in the child's life. The way in which the phenomena of learning, as well as many similar notions, are perceived during pre-school years could be of great value for teachers working with children not the least in evaluating their work.

We believe that in order to evaluate the child's experiences in pre-school we must have tools for doing it, and one possible way could be to interview children in the proposed way to get an idea about what the child has perceived of the reality in which he is involved. This methodological description should give a basis for attitude as well as technique to be used.

5 THE CONTEXT OF DEVELOPMENT

This chapter aims at developing the contextual view of the present study defined as the pre-school milieu which, compared to the home, is structured in some way to educate children. The assumption and fundamental purpose is that to understand children's conceptions one has to consider the context. This being the case, a brief presentation of ideas and reality in Swedish pre-school education is given. (Children start compulsory school at 7 years of age.)

A child always belongs to a particular age, society and group or family. These are constantly in a flux, in the sense of socialization. Socialization, the transferring of rules, attitudes and sets of values from generation to generation is necessary for a society to survive (Huch, 1977). What was important to transfer in our society some centuries ago might be totally unimportant today. Patterns of socialization influence the mental processes which make us perceive and conceive the reality around us. The filter laid over reality, and through which we have been taught or learnt from experience to interpret the world, seems to us obvious and correct. It is somewhat difficult to think of the fact that a phenomenon considered in an obvious way in one society can be considered in a rather different way somewhere else.

In Western countries we more or less take for granted that children's development is built into the child. One example is our view of motor skill, like walking at approximately one year of age, or being able to give a sign to parents when to urinate at two years of age (Gesell, 1961, Bruun, 1968). This is roughly the age at which we expect children to manage these situations properly. This may be compared to Digo-children in Africa who are supposed to perform these functions far earlier, and also do them (Grünewald-Jönsson, 1981).

What we want to indicate here is the fact that development is not an autonomous or general process, but a process which goes on and is interpreted in a particular context from the knowledge and conceptions people have at the time.

In the old agrarian society in Sweden, bringing up children was no problem, since they were together with grown-ups with whom they could identify and whose work they would later take over. Bringing up children became a problem when production and consumption were divided. Today's society is far more complex, in the sense that it is more or less necessary to read, write and understand symbols, which places more demands on people in general and particularly on children. Childhood is a notion which has developed in the last 300 years (Tucker, 1978). In every society where people talk about bringing up children ideas about what to do *with* children is based on assumptions *about* children, about what is of value in educating the child. Education has always been focused on behaviour; on what is visible, and the children's world of thoughts, have been more or less ignored.

What is then the source of children's thinking? The child's thoughts cannot be taken separately because thoughts are always created in a situation, in a context. In other words, you can say that the child's thoughts are created in relation to his social world.

As stated earlier, a basic assumption which has guided this study is that the development of children does not occur in general but in specific contexts, which then also influence the conceptions which the child expresses. The phenomenon of learning which this thesis deals with, has been looked at in a study where the context was the Swedish and Indian pre-school respectively (Pramling, 1981).

All culture represented by parents and teachers in terms of education reflect the fact that it is via education and knowledge that one progresses to a "happier life" in India. The attitude among people in higher castes is that they are expected to teach their children elementary skills. They actually spend time every day in teaching their children. The ideology is that the earlier one starts to educate the child, the better for him. In Sweden, the structure of society is quite different. It is no longer self-evident that higher education means a better life and happiness. In contrast, the attitude to education is somewhat the opposite to India. Swedish children should play and enjoy themselves; learning in early years is supposed to take place through play with educational toys.

In children's conceptions of learning one can notice an attitude which could be characterized as passive among Swedish, and active among Indian children. This means that not a single Swedish child under the age of five said anything which showed that they were aware of their own activity in learning, while some Indian children said things which could show signs of an awareness about their own role in learning. Neither did Swedish children relate what they did now to the future, while all the Indian children had grandiose visions about what they wanted to become as adults, and they also talked about achieving their aim if they worked hard now at the age of four. In the Swedish children's thinking, what they are doing at that age does not seem to have any implications for their future existence as adults.

We do not wish here to discuss whether one context or the other is good or bad, but what seems obvious is that the children's conceptions concerning reasons for attending pre-school are created by their social context. It is possible that different expectations, and consequently what is going on in pre-school in India and Sweden respectively, are the main causes of the children's different views of learning. Let us now turn to the ideas and reality of the Swedish pre-school.

5.1 The world of the child

The pre-school in Sweden today has its roots in the 19th century in three different activities, infant school, which started 1836 (småbarnsskolan), crèche, which started 1854 (barnkrubban) and kindergarten, which started 1896.

Kindergarten had an *educational programme* which was based on the principles of Fröbel. According to his view the child is like a plant, which the gardener (teacher) helps to grow, using specific material and methodology. Play and creativity received central roles. His material "the play-gifts" had an educational function when playing with the material. The infant school took over the features typical of the kindergarten.

The crèche was mainly a social institution for taking care of working, single mothers' children. The activity was mainly *to take care* of children, try to keep them neat and clean, and keep them away from committing crimes in society (Simmonson-Christenson, 1978).

In the 20th century, the names of these two activities changed a few times, and it is notable that kindergarten changed into play-school in the 1940's and later became a school for children of all classes. It became a social commitment and not dependent on private funds as previously.

The real expansion in activities for younger children arose in the two last decades as a consequence of the increasing number of women going out to work. There has been an increase of approximately 210.000 children coming into contact with pre-school activities during the last two decades (see table 1).

Table 1. Children in pre-school in Sweden

	part-time	full-time
1960	38.373	10.270
1980	136.000	119.500

When this tremendous expansion began, the crèche had already been characterized as "day-care" and care aspects had to be de-emphasized for pedagogical reasons. The educational programme in the 1960's at play-school as well as at day-care can be characterized as well-structured training in the area of motor, emotional, intellectual and adaptive development. This education was based upon the development theory of Arnold Gesell (op cit): a maturity theory where development is more or less programmed within the child, and the teachers' role is to arrange the milieu and supply the proper material. In Gesell's theory, every age level is carefully examined with regard to the child's motor, emotional, intellectual and adaptive functions. With the knowledge of what children were supposed to do at a particular age, it was fairly uncomplicated to make up the programme for children since they were together in groups of an equal age. Beyond training in the areas mentioned above, it was important to make the group of children into a unit, to get a "we-feeling". One criterion for a skilful teacher working with infants was the ability to fascinate the whole group of children and keep children busy. Although there were similarities in the way teachers structured the activities at play-school and at day-care centres, their relation to children showed different patterns. In an observation study, Kärrby (1976) found that teachers at play-school instruct and guide children in their activities while the teacher at the day-care centre shows more emotions and tenderness towards children. It seems that either teachers working in play-school or day-care represent different personalities, or they find these activities demand different sides of the teacher's personality.

In 1968, the Swedish government set up a committee consisting of experts to examine the question of activities and care for young children. One question was to find out the possibilities of lowering the age level of compulsory school. In 1972 the group of experts presented their opinions about activities and care for young children in a document called BU (Barnstugeutredningen , SOU 1972:26-27). New theories of child development were chosen as a basis for the educational programme. Ericsson's socio-emotional theory supplied a view of the emotional aspect of development, while Piaget's cognitivistic theory supplied a view of the intellectual aspects of the child. There were not only scientific theories for the educational programme but an official aim for the pre-school, which now included part-time, as well as full-day activities. The name part-time or full-day pre-school should accentuate their equal educational programme. Only one type of pre-school should exist where children could stay in the same school whether he attended it part or full time. The staff working in both kinds of activities should mainly be pre-school teachers. The official aims of pre-school education can be summarized as follows:

> *Pre-school education should aim, in co-operation with parents at giving each child the best possible opportunities for the rich and varied development of his emotional and intellectual resources.*
>
> *In this way pre-school education can help to lay the foundations of a child's development into an open, considerate individual with a capacity for emphathy and co-operation with others and capable of forming his own judgements and arriving at his own solutions to problems.*
>
> *Pre-school education should in each child lay the foundations of a will to acquire and use knowledge for the betterment of his own living conditions and those of other people. (Förskolan, Part I, SOU 1972:26)*
>
> *The first of these points indicates an essential prerequisite of pre-school education, a prerequisite which is fulfilled in co-operation with the child's parents. Home and pre-school should be regarded as the total environment in which a child grows up during its pre-school years. If the two cooperate in caring for the child, they can provide greater and complementary experiences of benefit to the child's development. Pre-school education brings a child into contact with both adults and other children.*
>
> *The second point is concerned with 'upbringing or social education', referring as it does to the ability of pre-school education to lay the foundations on which a person can acquireopenness, vitality and a capacity for making up his own mind - qualities which are a prerequisite for good relations with other people.*
>
> *The third point reflects the more long-term purpose of the learning process. Small children are constantly plunged into learning situations. Step by step, all the experience they acquire generates new knowledge and closer familiarity with the world around them. Children have an innate curiosity and will to discover which impels them to acquire new knowledge. This autonomous activity, which is an expression of the child's own need to understand the surrounding world and the new knowledge it has to offer, is something which must be encouraged by pre-school education.*

> *The specific aspects of child development which pre-school education, in co-operation with the child's home, should foster are the development of self-concept, communicative ability and concept formation.*
> *(Swedish Institute, 1977)*

To provide for the aims outlined, suggestions were made about another structure within the pre-school, and about a new method of working. Groups of children should now be mixed in different ages, called *sibling groups* (3-7 years) and *infant groups* (½-3 years), since that should provide a more "natural" way of co-operating and understanding what "consideration" means in reality. Many children in Sweden have no brothers and sisters and pre-school could be a substitute for this kind of relation. Another structural change at pre-school was the emphasis on *co-operation* in all directions, both inside and outside the pre-school. The staff, whatever their background was (pre-school teachers, day-nurses, charwomen, or cooks) should work in a team with *shared responsibility*. The emphasis on co-operation and shared responsibility with children's homes, among staff and with children, were based on the expert-group's conception of democracy (Rosengren, 1976).

The design of pre-school was also to be changed into a more open and flexible milieu. In pre-school, *activity-stations* should be made available where children could work with their interests. A supply of different activities and play-material should be offered children, who then would choose what to do. The child had to take responsibility for the content of their own learning to some extent.

There are some obvious similarities between the theories of Piaget and Eriksson: the hierarchical stages in a person's life, the emphasis on working with impression, a striving for equilibrium and an interaction between the organism - ego - milieu. On such a basis it was, however, difficult to suggest a practical method for working with children. Instead of talking about method, an attitude or relation to the bringing up of children was described. The model worked out was *the dialogue-pedagogical model*, which means that there should be a continuous dialogue between teachers and children - not only verbally, but also with regard to feelings and needs (Schyl-Bjurman, Strömberg-Lind, 1976). The main aim seemed to be to develop a sensitivity in the teacher who should really listen to the child's needs and interests and working from there. The way to behave, how to treat each other, was carefully described but there was no discussion at all about content. Another emphasis that we should not forget was on *openness towards society:* the pre-school should not constitute an isolated island, but be a part of society, in which also handicapped children should be integrated. The most obvious official result of this investigation work was a new direction in society to provide care for young children.

In 1975 the Pre-School Act came into effect, and two years later an amended version of this act, called the Child Care Act, covered the provisions of leisure-time centres for children between the ages of seven and twelve. The Child Care Act guarantees all children at least one year of pre-school education, the municipal authorities being liable for its provision. The act also includes children suffering from physical, mental, social or linguistic handicaps. These children are given the oppurtunity of taking part in pre-school activities at an even earlier age. The act also prescribed extended activities in collaboration with the child health service to find those children with specific needs for earlier access to pre-school. Children who are in hospitals, orphanages or other institutions must also be given the opportunity of taking part in activities corresponding to those of pre-school education or leisure-time centres.

During the period between the presentation of the BU document and the Child Care Act, a lot of experimental work was carried out both on the initiative of the Central Board for Social Welfare Service and of people in local communities. All staff working at pre-school had to attend a 30-hour course of further education. There were also new directives for educating pre-school teachers in line with what was suggested for educating children at pre-school (SOU 1974:42).

The result at the pre-schools was confusion. Some teachers retained their earlier methods of work since they could see no difference in BU's directives; other teachers interpreted them as if all the activities should be initiated by the children. But as very few suggestions arose in this way, children just strolled around in pre-school all day and played with whatever they desired. The result was a kind of "laissez-faire" pedagogy. Since the direction of BU reflects a very individualistic view of education, all kinds of group activities were abandoned. This was also a result of the mixed age groups which made it far more difficult to introduce an activity where children of all ages could participate. These mixed groups became a reality in most municipalities, and the mixture became even further developed with children between ½-10 years of age since Familjestödsutredningen (Investigation for Family Help) pointed to the problem of the youngest children in pre-school (Familjestödsutredningen, 1978).

With regard to the shared responsibility among the staff and co-operation with parents, some progress is visible, but in most pre-schools the previous structure has remained: teachers working with one group of children co-operate and have the responsibility for their children, while staff in the kitchen and cleaners have their responsibility in other areas. With regard to co-operation, there seems to be ambivalance among teachers. On the one hand, they want parents to be involved in pre-school activity, but on the other hand, they do not know how to manage it, since parents are such an heterogeneous group of people with varying opinions. As long as co-operation takes place on the pre-school teachers' conditions everything is fine, but beyond this there is less willingness to co-operate. Co-operation is not on equal terms. Co-operation between teachers and with parents is time-consuming, but what does it really mean for children in their every-day reality?

Very few, if any, of the consequences of the reform have been evaluated for children in pre-school. One might say that, while previously the teacher structured the child's experiences, it is today the play-material which serves this function. Two observations studies of children's play (Norén-Björn, 1980, Jorup, 1979) at pre-school have shown how seldom there is contact in terms of dialogue between a teacher and a child, which should,according to BU, be the starting-point of any activity. Play was observed as a lot of running around and little role-play. One reason for this could be that,since the child seldom sees grown-ups in activity,they have nothing to imitate (Jorup, op cit). If this is correct, it is a serious problem in the development of language and thought since these functions are more used in a role-play situation than when the child is riding a bike. Of course, infants move around a lot but they surely also need to elaborate their thoughts. Norén-Björn, (op cit) found children playing with material 98% of the observed time, and very little communication between teachers and children was seen. In another observation study the kind of verbal communication which went on between teacher and children was registered. Most of the communication was labelled "supervising" which means that the teacher was trying to teach and tell children how to behave and a dialogue happened accidentally. Teachers' used most of their communication to direct behaviour. As a consequence it was also the teacher who took the initiative in communication and rarely the children. This study also shows how little dialogue is found in pre-school (Berglund, Mattsson, Svensson, 1979). What then has this reform really meant for the work in pre-schools? Schyl-Bjurman (1982) has evaluated one of the experimental communities with regard to social change on the part of the individuals involved in the experiment, in relation to the intentions of BU. She maintains that individuals, whether they are politicians at the top of the community or pre-school teachers working with children, have to change attitudes and ways of thinking before any change in every-day work can be seen. To change one's way of working one must change oneself to some extent and there must be a felt need for change. Nobody ever felt that need for change in the community, the idea of change came from above, from central authorities. Consequently, no one tried to take the other's view and understand the other's perspective: most administrators did not even read the official document, but struggled on their own account, since they felt threatened by the process of change. Schyl-Bjurman's conclusion is that

> *... a reform programme is not primary evaluated from an educational viewpoint, but it is accepted or worked against in relation to the social consequences it might have for the people involved, individuall and/or in group.*
> *(Schyl-Bjurman, op cit, p. 226/Our translation)*

With regard to social change, as Schyl-Bjurman describes it, it is completely understandable that the general debate in society about pre-school has concerned external frames, as, for example, how many children in a group, how many teachers etc. Most of the intentions of BU have not become a reality. Not even the notions of pre-school activities have changed. The notion of pre-school today stands for part-time pre-school and day-care is used for full-day pre-school[2].

On a general level, the content in pre-schools and day-care centres has been less well-defined. This is fully understandable not only since the focus have been on another way to work, but also because co-operation and shared responsibility have to be about something. This is also the general trend in content demands the past year from people working in the field as well as from the National Board of Social Service and Welfare. Their new development plan for child care talks about the necessity to construct an educational programme since the content of activities has, to a large extent, become a question for the single teacher to decide within the organizational frames determined in the community[3].

With regard to the education of infants one can say that, by tradition, the notion of learning has been very little used in the activities developed for children before the beginning of compulsory school at the age of seven. Development has instead focused on maturity. As mentioned previously and before the new directions BU came, children were trained in their capacity of different steps in their process of maturation by a programme carried out by the teachers. Since the old theory of maturation was changed toward new psycho-dynamic theories in BU, the old training programme was no loger of any interest. No new programme was presented, however, and consequently focus was on social behaviour. Emphasis was placed on the child's way of behaving towards others and to the world around them. The single child's activity was focused upon instead of the group's activities as previously.

One of the experts in the committee admitted some time after the presentation of BU at a conference that the aims were written from an individualistic point of view; the fact that there is a *group* of children at the institution was more or less forgotten in the directives of the committee.

To summarize the pre-school programme of today, we would like to say that the intentions in the official aims of taking children's experiences as these are reflected in the thoughts of the child as the point of departure for activities in pre-school seems to be an excellent idea, but there must be a content on which children can elaborate their thoughts. What is it that children should develop their concept formation about? With regard to what has been said, the ideas of the "dialogue method" in terms of how to behave towards each other, one can believe that social behaviour is a concept formation which has been developed in the pre-school of today. Social behavior or situations have been concrete and obvious to the child, but concept formation in other areas has been diffuse and abstract. That children have to work concretely with, and reflect upon, notions to get an understanding is obvious, but it has been a difficult task for pre-school teachers to discover how to be an active part in children's development of thoughts.

5.2 An average day at a day-care centre and pre-school

Since the expansion of day-cares and pre-schools has been considerable in the last two decades, the buildings also look more or less the same all over the country. There are day-care centres in old houses and in apartments, but most of them are wooden bungalows, where the pre-school is situated in one part of the full day-care building. Many pre-schools are apartment houses. It is not only that the buildings look similar from the outside, but furnishing and play material are also more or less the same. Most furniture and equipment is proportional to the children's size but more demands for proportional furniture etc for grown-ups have been raised in the last few years. With expansion, an increasing number of companies selling educational play materials have come on the market. These materials are widespread and include everything from three-wheeled bikes to puzzles and books. Day-care centres are open 12 hours a day (6.30 am - 6.30 pm) and serve families with both parents or single parents working, and children arrive and leave whenever it suits their families. A full-time child at a day-care centre gets three *meals*, breakfast at around 8 am, lunch at noon, and snacks at 3 pm. After lunch, it is common to have about an hour's *rest*. For younger infants and children who come early in the morning this entails a period of sleep, while for other children it means a quiet pause and listening to fairy tales. Another point of the day is *outdoors*, playing in the yard. Putting the whole group or part of it together in some activity, like singing or talking about a particular topic, happens frequently at some day-cares and seldom in others. The rest of the day can be characterized as *free play*, which means that the children choose what they want to do. Beyond educational toys and games there is a lot of material available, like wood and nails, paper and paint, different kinds of clay, zink and toys for water play, material for construction, books and records, material for weaving and sewing, clothes and household utensils for cooking and experimental materials etc. Sometimes children work with a particular theme during a period of time, for example, "clothes and hygiene", "fruit and vegetables", "animals", "means of communication", "the different seasons of the year", etc. At times, children also visit different places outside the centre, e.g. a parent's place of work, a museum, a theatre, a library, the woods, or a swimming pool.

Food, rest, out-door activity and free play is common to all day-care centres, but the activities described above can vary in extent as well as in quality between different centres according to how the staff organizes children's experiences within its economic framework, the activities available, the structure of the group, and last but not least, the knowledge and interest of the staff. Most day-care centres have between 15-20 children in each group of varying age[4].

Pre-schools comprise three hours of acitivity for a group of 20 children per day (age 5-6 years). Children attending pre-schools have either someone at home taking care of them or spend the rest of the day with child-minders. The care function, including meals, rest, etc does not exist at pre-school, but activities are similar to the ones described for the day-care centres. In most pre-schools there is also a period of teaching, when the whole group sits in a circle to talk about something. The staff are a pre-school teacher and an assistant.

It is obvious that, in a day-care setting, there are routines for caring for the children which take a lot of time. But to get day-care activities accepted as education, as has been done more in pre-school, the notion of "education" has been stretched to include care and socialization. Children are seen as being in a pedagogical setting from when they arrive in the morning utnil they leave in the afternoon. This is emphasized by the enormous amount of energy on the teacher's past put on e.g. "pedagogical meals" where to eat is not the primary aim, but to behave properly at table. You could say that there is an aim to get the day-care centre as well as the pre-school viewed as a learning milieu, while the phenomenon of learning is extended to include socialization in general.

6 PRE-SCHOOL AS A LEARNING MILIEU: TWO OBSERVATIONAL STUDIES

Since there is no curriculum or specification of the content of pre-school one cannot talk about learning in a defined way - for example, about what knowledge or skills a child is supposed to have after pre-school in general. However, since there are situations which are planned and structured more than others for the learning of a particular content, and since we assume that conceptions of learning are influenced by the context in which it takes place, we want to examine these learning activities carefully. Despite the trend previously indicated towards looking at pedagogy as including every activity in a pre-school setting, it is common with a more structured teaching-learning situation in the working with themes for 1-2 weeks.

Social development is what most pre-school teachers would consider as the focus of education in pre-school, but despite this, themes should be worked within which children are supposed to learn about the content. How then do teachers work with the themes? How do they structure their teaching, and with what means? What do children understand of what teachers want to teach them?

Two observational studies with different thematic subject-matter have been carried out with the purpose of describing the entire pedagogical process from the teacher's intentions in teaching to seeing what the child perceives in the teaching situation as well as in the particular thematic content. What does the message of the theme look like from the child's point of view?

6.1 The first study: form and colour

This study has been reported in more detail in a paper by Magnusson and Pramling (1981). Infants have difficulty in talking about a phenomenon like learning in general, but since learning from their point of view was in focus, a situation well known for the child was chosen in which he could reflect and elaborate his thoughts. These situations became the structured activities where the teacher intended to teach children about form and colour. In this way a concrete experimental situation for the child to talk about was made explicit.

In accordance with what has been said above, the aims of this study were:

1. To describe the teacher's pedagogical intentions as regards a particular theme.
2. To describe how the pedagogical intentions where carried through with children, i.e. how the theme was accomplished with what means and also what was characteristic in the interaction between teacher and children.
3. To describe how children perceived the situation which the teacher structured as learning, and how they actually conceived the content.

The third point, children's conceptions, is to be seen as the main focus of interest, while the teacher's intentions and teaching are background factors for the understanding of these conceptions.

6.1.1 Collection and analysis of data

Data was collected in a pre-school with eleven 6 year old and six 5 year old children and three adults (one pre-school teacher, one nurse, one teacher-training student). The pre-school teacher was leader in a double sense, both formally and in reality, and for this reason we let her represent the teachers.

The themes of form and colour were followed during two subsequent weeks. The research method was a combination of interview and observation. The *observation* can be characterized as *narrative* (see Brandt, 1972) where as much as possible was registered in a descriptive way during the time when the whole group or part of it was involved in the activities structured by the teacher. What was registered were the teachers' actions, the children's actions, their response to each other, and the methods the teacher used.

An *interview* with the *pre-school teacher* was carried out mainly to find out her aim with the chosen theme (her plan was already written down), what she considered was valuable for pre-school children to learn, how she structured her work to reach her goal and why she worked the way she did.

The *child interviews*, 22 altogether, were conducted at the same time as the theme proceeded. Some children were interviewed twice, others only once, depending on the circumstances at the pre-school. Every interview, which lasted about 15-20 minutes, was recorded and later transcribed word by word. Interviews were carried out with one child at a time, separate from the rest of the group. The interview method was the one described earlier (see p.46).

The concrete experiences of the child which had been observed constituted the basis of the dialogue. There was also some concrete material (different forms and colours, paper and pencil) and the natural furnishing of the room to talk about. The interview covered four points:

1. Get the child to describe what he has been doing during the day in the "class-discussion" and other activities decided by the teacher.

2. Get the child to reflect upon why he did the things he mentioned.

3. Get the child to talk about learning (after a while) if he did not talk spontaneously about it.

4. Get the child to teach a Monkey (hand-doll) something he had learnt himself about colours and forms, respectively.

The analysis was made from the transcribed interviews (see further p. 46). What the child expressed in the interview was taken as a sign of what he perceived of the learning situation as well as of the content of the activities in which he had participated. Since the content of the interviews developed as a result of the child's conception of the learning-teaching situation, it was not possible to compare single answers, but the interview was looked upon as a whole. It was a great advantage to have made the observations and seen what the children had actually been exposed to. We had an equal frame of reference and could "help" the child to remember different occasions; thus what had really happened could guide the dialogue. This is even more valuable in the interpretation of the results. On the basis of the observations, attention was directed towards important things in the interviews which might in other cases have been lost. The reason for using a hand-doll was to put the child in a teaching role and situation.

The analysis of the child interviews aimed at finding qualitatively varying conceptions of the *what* and *why* of the structured activities. The analysis of the observations aimed at revealing what happened in reality and how the teacher's intentions show in her work.

6.1.2 The teacher's intention

The teacher's more general intention about what to teach children and how this teaching could be done to give children opportunities to learn will now be summarized from the interview conducted with her. The teacher indicated four areas of importance in relation to what to work with. One of the most important areas is children's *(1) social behaviour*, so that they will be able to solve their conflicts themselves. A teacher's role is to be sensitive to everything happening in the group, to give positive reinforcement when children are able to solve conflicts by themselves and to support uncertain children. There is always a lot of talk about what happens in the group. Children also ought to have *(2) some knowledge* about themselves as well as about phenomena around them. The teacher's role is to handle concrete material, which children can deal with and be engaged in. Children have to be active, also in talking and explaining, and for this reason the teacher tries to listen and take interest in what they have to say. Books are used to discover knowledge, so that the children will understand how to acquire knowledge from books. Some *(3) skills* are also important, e.g. to handle a pair of scissors or keep the pencil straight. The teacher's role is to give children an opportunity to practice in these activities, since practice is the only way to acquire these skills. The last area of importance is *(4) prepare for school*, in the sense that when children have visited the school milieu they will feel more secure when beginning there. It will also help children in school if they are able to wait for their turn or write their names. The teacher's role is to let children acquire opportunities to come into the world of school, and to let one child speak until finished without being disturbed by other children. The teacher should also adjust questions to the child's capacity so they succeed in answering.

The teacher described her teaching as based on both the theoretical knowledge from her training and also to some extent on ideas changed during experience in work. In talking about the new direction in pedagogy, as for instance "dialogue-pedagogy", she stated that she had read some books, heard from students and teachers from teacher's training college, and then taken into her work what she found of value. Her own change had been towards less preparation for herself and more activities for the children. Her conclusion was that the most important factor in working with infants was to be a good model, as children do not do as you say, but as you do. She also had some reflections about what actually goes into children's minds.

The theme of form and colour was seen as an example of an area of knowledge which is useful for children to acquire. The colour theme was intended to teach children to distinguish between *basic colours* and *mixed colours*, tell their *names*, understand *what colours were mixed* in the mixed colours, and also what *nuances* are. In the theme of form, the aim was to give children *fundamental concepts of forms*. The forms chosen were the *circle, square, rectangle, triangle, and 'large', 'small', 'thin' and 'thick'*. Children should learn to recognise and describe the above.

6.1.3 The actual process of instruction

At the beginning of a new theme, new material, e.g. puzzles or games aimed at training concepts and skills related to the theme, were laid on the children's shelves. However, children's free play with this material was not observed. Instead the structured activities which took place every day as a "class-discussion" with all the children, and other teacher-planned activities related in time as well as in content to the "class-discussion",were observed. These related activities often took place in smaller groups of children. During the "class-discussion", everybody was supposed to participate, the other activities were mostly a free choice. The "class-discussion" lasted from 10 to 60 minutes, with an average of 40 minutes a day.

Let us look at how the teacher dealt with her intentions in the four areas she suggested. According to the teacher, it is important to work with *social behaviour*. Within social behaviour is the notion of showing each other consideration, taking responsibility, acting as a functioning group and supporting an individual child. On one occasion, a child said how he had spoilt something which another child had made. On occasions like this the teacher always showed her attitude and made her opinion very clear. The rules for being together was spoken about. If a child's attention was weakened by "something" (e.g. a toy) the teacher immediately let the child know that she had realised it. Children were to co-operate and share the responsibility as for instance three children had to make "salt-dough" by themselves which they did. After an activity children were alotted a function each which they had to carry out. When children made forms out of "salt-dough", one girl said she did not want to. But the teacher explained why she had to make a form and told her it was her own choice to leave the table after she had made one. On another occasion in the athletic hall a boy backed up to the wall to try to slip out of the game intended. But the teacher realised this and told him that he had to participate once. She said it with such conviction and lack of hesitation that the child could not but do what she said. In other words, in such situations she expected children to do what she told them without arguing. It is also worth noting that the children who protested always went on playing for a long time; it seems as if these children needed a little extra pressure to engage in the group activity.

The *social training* which was seen as a part of *preparing for school* was sometimes difficult to separate from social behaviour. Included in social training is the skill of "daring" to speak in a large group of children. This children get a lot of opportunities to do. The teacher was careful and asked everybody when talking about something; furthermore everybody got the time and "help" they needed to get courage to or the chance to think over what to say. Questions were partly adapted to the level of difficulty which was expected of the child who was supposed to answer. The teacher did not want a child to fail, so she often changed her formulation until the child succeeded. She almost never left a child with a sense of failure. If other children laughed about a wrong answer, she took the part of the child who failed. Everybody had their chance to speak, but it was as important to wait in turn - a necessary corollary.

If one child answered a question for someone else or spoke to his neighbour the teacher said e.g. "Is your name Björn?" or "Now, didn't you Anders, hear what Eva told us?". On other occasions, like when reading a fairy-tale, spontaneous talk was encouraged. To write one's name was seen by the teacher as an advantage, and children also had to do it every time there was an occasion for it. The most important aim, in preparing for school was to let school be a secure and a familiar milieu for the child. There were also many contacts with school. The athletic hall was used once a week, and some children went to school and borrowed slides. Another day they went to a theatre play at school. So during this short period of time, there were four contacts with the school milieu.

Skills and knowledge were acquired by the children when they worked actively with a concrete material. The teacher's structuring of these situations when children were supposed to learn about form and colour was concretized. Sometimes the teacher demonstrated, but most of the time they worked practically with expendable material (paper, paint, clay etc) in order to concretize and understand the concepts. When the teacher introduced a new material, like for instance "blocks" of different sizes and forms, she sent them around for everybody to feel. There was a lot of motor activities, e.g. the children used their own bodies to make forms they learnt to make, colours in the sign-language, walked around and looked for forms or compared colours of their clothes. Children learn through experience according to the teacher, and this was really how the teaching was structured. To acquire a skill you must train, and this obviously represented in the teaching structure. Training consists in the repetition and reiteration of concept. The teacher spoke about the concepts she wanted the children to learn as often as possible. It seemed like she drilled knowledge into them through repetition in addition to the concrete experience gained when the children activitely worked with these concepts. Although there was sometimes a long period of "class-discussion" in a large group, it seemed like the teacher had the children in her hand, i.e. she was extraordinarily sensitive to each child's needs. When a child became restless during the showing of slides, she went down on the floor and put her arms around him. When many children began to show restlessness, she paused for a song or some motor activity. What the teacher indicated as important work areas, she also carried out in practice. Her ideas about how children learn could also, to a large extent, be seen in her actions. There was only one thing which she pointed out and which we could not notice in her work: her idea of using books to show children how to find knowledge. She never did this during the weeks of the study.

6.1.4 The child's experience

Every child had been exposed to the same teaching, at least in the activities in which all were required to participate. Work with a whole group of children with particular notions, which the single individual has to understand, seems to pre-suppose that everybody is at an equal level of learning and development. It was evident that this was not the case. The experience of these themes was to a large extent varied for different children and this was shown in their response to the teacher or actions in the group. For some children, the teaching was far above their capacity while to others it seemed dull and too easy since they had had the same themes the previous year (some children were in the same group for the second year). But of course, one could also find the ideal pupil who was positive and interested in everything. In an objective sense, these children had received equal teaching, been exposed to the same influences, but the teaching had given the individual child different experiences depending on the child's earlier experiences and his ability to understand the content as well as the situation.

6.1.4.1 The child's understanding of the teacher's intention

As previously mentioned the purpose of this study was not to evaluate how much, or what children knew after these themes, but to describe how children perceived the content and the learning activities.

At the start of the interview there was a general discussion about pre-school in which children exposed their conception of it as a place to learn or a place to play. Some children perceived that they were expected to learn, while others seemed completely unaware of this aspect. When children described the "what" and "why" of the structured activities which constituted the themes, two categories of conceptions were found.

A Apprehending the activity only

Children are categorized here when they express themselves in a way which seems as if they have not understood that the purpose is "to learn" something. They do not reflect upon the aim of the activities, but take these for granted. They perceive it as if they do things because of the activity as such, or because the teacher tells them to. Although the notion of learning was introduced by the interviewer, no reflections on this were made by the child.

> *Anders 6:2*[5]
> *E: You say you've painted - why have you done that?*
> *S: I thought it was fun.*
> *E: But why did the teacher want you to do it?*
> *S: Because I wanted to paint - so there would be a lot of groups.*
> *E: But why did you have to paint with the red colours?*
> *S: Because I thought it was fun.*
> *E: But what do you think the teacher wanted you to think about?*
> *S: I don't know.*
>
> *Gunnar 5:2*
> *E: Why did you talk about circles today in the group?*
> *S: I don't know.*
> *E: Why do you think the teacher wants you to talk about it?*
> *S: I don't know.*
> *E: What do you find most fun at pre-school?*
> *S: Playing with dough.*
> *E: Do you think it's fun?*
> *S: Yes, we've done it twice now.*
> *E: Do you think the teacher wants you to learn something?*
> *S: Hm...*

This category could be characterized as *if learning has not been distinguished from doing*. The reason for the activity is seen in terms of the activity itself.

B Apprehending the pedagogical intention - to learn

In the answers categorized here, children have used the notion of learning or similar notions which show an understanding of the teacher's intentions of teaching about colours and forms.

> *Lena 6:11*
> *E: Why do you think the teacher wants you to work with forms?*
> *S: We learn about it like we do in school.*
> *E: And why must you learn about forms?*
> *S: When we go to school, you already know the forms from pre-school.*
>
> *Anneli 5:11*
> *S: We've spoken about colours now ... so we can learn about colours ... different colours and which colours you can mix.*
> *E: Why have you done that?*
> *S: Mm, I don't know.*
> *E: Why do you think the teacher wanted you to learn about colours?*
> *S: What colours you can mix together.*

Characteristic for these conceptions is that they imply a distinction between the activity as such, and what is behind it, a "learning". One could say that *learning is here distinguished from doing.*

6.1.4.2 The child's understanding of what it takes to teach someone

To acquire further information about children's conceptions of learning, the child was asked in the interview situation to tell a Monkey (a hand-doll) everything he had learnt about forms and colours. The purpose was to place the child in a teaching situation in which he had to teach his knowledge to someone else. This showed how the child perceived how learning occurred and how someone was taught. We also had the opportunity to confirm or extend our knowledge about children's conceptions. We found three ways in which the child taught the Monkey.

A Rattles off

This way of dealing with the teaching situation is to rattle off colours or forms without any relation to the materials or learning.

> *Björn 6:10*
> *M: This monkey you see, doesn't know anything about what you have done and he knows nothing about colours and so can you tell him what you know about colours?*
> *S: Yellow ... blue .. red .. white .. black .. brown*
>
> *Magdalena 6:0*
> *M: But if I have dark blue and want light blue ..?*
> *S: You .. I don't know yet.*
> *M: Why should you know what colours are what ..?*
> *S: I don't know so very much about colours, Chico.*
> *M: How have you learned?*
> *S: How have I learned! I've learnt at home, I suppose.*
> *Do you know the alphabet, Chico?*

M: Mm....
S: I'll teach you . R, A, B, C, G, O ... and then there's of course, sixteen.

B Describes and points out

Children point out material visible in the room to describe colours and forms. As the Monkey asks how to learn, the children designates further.

Niklas 6:0
M: And this monkey, you see, he says, Niklas, I don't know anything about colours .. couldn't you teach me a little about colours.
S: Yes, red .. light blue and yellow .. and black .. and white and grey.. and brown .. and lilac .. and orange.. pink.
M: But Nilkas, how will I know what is what .. look - what's that, I don't know what's what. How will I learn?
S: That's red .. that's orange .. that's green and that's grey and that's blue and that's lilac and there's no more .. yes green ..
M: But I don't know .. which was the grey colour .. what do you do to learn about colours then.
S: I don't know.

Magdalena 6:0
M: You know both the alphabet and different numbers, how clever you are, and you know different colours..
S: I'll tell you which colours the flowers are .. that's yellow and there's green and then there's pink and dandelions that are yellow and then there are flowers that are pink ..

C Gives advice

In this category children say to the Monkey how to go about learning the forms or colours, e.g. by looking carefully, by guessing or by asking teachers or parents. This view of teaching can be seen as the most advanced one.

Anneli 5:11
M: But how do you think I should learn then.I want to learn about colours too.
S: You try and paint with colours.
M: But how will I know which are red?
S: Red .. don't you know what red looks like ...
M: Mm ... I don't know.
S: Mm .. it's like this ... that's red .. (points out)
M: But if I sit and paint and I don't know which is red .. what do I do then?
S: You look.
M: .. ah-ah, yes colours are hard .. don't you think so ..
S: Mm ..
M: But I don't really understand how I'm going to learn about colours.
S: You ask for the colour you want .. and then you ask what colour it is.
M: Who will I ask ..
S: You can ask the teacher.

Some children utilized more than one of the ways above to teach the Monkey, while others never came further than rattling off forms or colours. The hand-doll was a valuable element in the interviews. The spontaneity of the children seemed to increase when the Monkey was shown.

It is obvious that there are qualitatively differing conceptions of learning, depending on whether the child perceives the expectation that he should learn or not.

As we have seen, children's conceptions of what could be defined as learning differ. We shall now turn to what children conceived of the content in the themes, colour and form. In the analysis of the content from the interviews as a whole, and in attempting to find the children's qualitatively differing ways of conceiving the content of these themes, we will focus mainly on children's understanding of the content as comparable to their understanding of the intentions of the teacher (se p. 66).

6.1.4.3 The child's understanding of what is required to learn the content.

By focusing the content in these observed activities two distinct categories were found to describe children's conceptions.

A Focusing on the situation

Children concentrate here on a specific situation, which means that they *focus on the surface of the situation* (what to do). The character of conceptions in this category are expressed by children in terms of mechanically, rattling off, denominating or describing colours or forms. But there are also children who use the notions basic colour and mixed colour without being able to explore these, or tell the difference. These children also anchor their intention in the activity as such, e.g. you talk about colours because you paint with them.

Magdalena 6:0
E: You were in different groups .. what did you do then?
S: I said I was going to paint and the others were too ..
E: What did you do with the colours then ..
S: We painted and I painted a boat and Carina painted a man and Anneli painted a monkey ..
E: What did you talk about in the group today?
S: We didn't talk at all almost, only a little .. I don't know.
E: You don't remember what you talked about?
S: No..o
E: Why do you think you played that a boat came loaded with colours?
S: I don't know
E: Why do you paint with colours then?
S: Painted .. because you can take it home and pin it up on the wall .. and you can make Easter witches ..
E: Why do you think the teacher wanted you to play that a boat came loaded .. why do you think you had to paint with different colours?
S: I don't know .. we had to draw with chalks as well..
E: Yes you had different colours .. different chalks and sawdust colour and ..why did you have that ..
S: So we would do something together..

Therese 5:4
E: Can you show me once again what was a triangle and what was round .. what's that .. it's a book you've got. What's that ..
S: A triangle.
E: The book's a triangle .. what else
S: I don't know .. a triangle looks like that ..
E: How do you know it's a triangle book then?
S: You have to see it.
E: How do you see it?
S: Because it has 1-2-3-4-5 sides

We can see in the example above of Magdalena (6:0) that she talks about both the process of learning and the content, i.e.*how* they had proceeded in their activities, and also *what* they worked with. The process and the content is interwowen for the child, i.e. the learning situation is the content. But let us look again at the child's central focus characterized here as the *situation itself* and comparable with how adults *focused on the text* when reading (see p. 36 ; these two phenomena are not fully in accordance, but we will come back to this).

B Focusing on reality beyond the situation

Here children direct their attention towards what the specific situations are about. Conceptions characterized give an expression of an understanding of the principle of basic or mixed colours, or an understanding of the exemplifying principle, which means that the child understands, for instance, that the four shapes talked about only *constitute examples of forms.* On the other hand, they are able to generalize and see a value in the knowledge they have acquired.

Niklas 6:0
E: Can you think of a time when it would be good to know shapes?
S: When you walk in the street and see cars.
E: Where do you find the shapes?
S: On a lot of signs..

Carina 6:9
E: Why do you think it's good to know shapes .. have you seen different shapes outside anytime.
S: Yes .. on cars ..
E: What shape are they then?
S: They're different .. on a Volkswagen and a Volvo and ., Saab.
E: What shape are they?
S: A Volkswagen? .. round and .. Volvo is straight and Saab is also round like ..

These conceptions reflect a focus on something beyond the situation in a similar way as adults can focus on something beyond a text while reading it, i.e. their attention can be focused on the reality dealt with in the text. What we see in children's understanding of what it takes to learn the content could be characterized as the beginnings of the distinction between the deep and surface approach (cf p. 36).

The first category described is characterized by children's lack of coherence in what they have experienced in the learning situations. They cannot connect different situations or activities together as a whole. Children answer mechanically about colours or forms when asked by the teacher. The children's understanding indicates a grasp of only fragments of what they have been exposed to, as well as a total lack of understanding of the teacher's intention, i.e. that the children should acquire knowledge. The situations have been experienced by the children in terms of what they have been doing and this very fact reflects well their way of thinking.

The second category described is characterized by children's understanding of what is referred to in reality by these activities or situations. Children could reflect about the reality from which the teacher had taught the examples.

Generally, children are able to label the basic colours but have a very limited concept of nuances as well as what mixed colours consist of. The concepts of basic and mixed colours are mainly on a labeling, word level rather than on a level of an understanding of the principle. Forms have troubled children more than colours: they seemed to be more difficult both to describe and to label.

It is more common for children to express an understanding of the surface of the situation than of what the situation is about.

6.1.5 Discussion

We will now describe some examples of the relations between children's conceptions and the way the teaching was structured.

Most of the teaching was of the labeling and describing type, e.g. what form the teacher showed or how to get the colour pink, etc. There were, however, a few occasions when the teacher gave an explanation, e.g. when she explained how the "sign-language" was related to different colours. This the children were also able to explain in the interviews. Sometimes when a "why-qeustion" was directed to the child, he looked surprised and replied: "Our teacher has never told us". Piaget (1973) says that children at this age-level never deal spontaneously with "why-questions", but perhaps an explanation is seldom given to them, since adults take a great deal for granted in the child's way of thinking.

The structure of teaching about colours was to work with paints in different ways every day; to do concretely what was talked about in the "class-discussion". Painting was seen as the purpose of talking about colours. There were very vague ideas about how to mix colours to get a third. Another notion was nuances. When this was introduced, children were divided into small groups to paint with different types of paint, where the result was different nuances on paper; however, when the children talked about this occasion none of them mentioned the notion of nuances, but talked about the different kinds of paint and *what* they painted. No one had understood how to obtain nuances, but they could label light, medium and dark colours. One child explained the particular activity as: "We should co-operate about something". This is what the teacher told her during the activity when she in fact wanted to make something she could take home.

The structure of teaching about forms was introduced by four forms, without any explanation of the existence of other kinds of forms. As a consequence, forms for these children were the four presented and no others existed. In teaching children to describe these different forms, the teacher tried to simplify their learning by breaking up the whole into parts; by defining the form by its edges and sides. The circle was defined as a form without edges.

As a result, everybody knew the circle, and many the triangle, but failed badly with the square and the rectangle since they both had four edges and four sides. To count the parts of the whole became such a focus that a child could say a form was a triangle since it had 1,2,3,4,5 edges! These are only a few examples, but it is obvious that the teaching structure has implications for what is conceived of the content of a theme.

It is not possible to evaluate what every single child has learnt during these themes since there was no evaluation of their knowledge at the beginning. In spite of this one could infer that there seems to be very little *left in the children's minds of what the teacher wanted them to learn*, even though there were children who had worked with the same themes the previous year, and despite the fact that they worked a long time (around 1 hour a day) with the theme. Time was an important factor, as well as the concrete experiences in which all the child's senses were used.

The content has been presented and worked with via sound, picture, sensation and motor activities. Repetition has also been evident: the same concept has been worked with repeatedly.

From an observer's point of view, it seems as if most of the necessary conditions for learning were there. The largest amount of time was for activities for the whole group of children, though it was clear that interest, and the possibility of the single child profiting from the content in the teaching situation varied.

The teacher never nagged or raised her voice, since a short pause for attention was enough to induce someone to be quiet. Her intention was to work with the group as a whole, and then try to support the individual child as much as time allowed. This was also the way in which she worked. She expressed doubt about *how much* went into the children's heads of what they had talked about, but whether or not everybody understood, being quiet and listening to other children was at least preparation for school in some sense.

In pre-school, social development comes first in official aims, as well as for this individual teacher. The pedagogical activities are seen as an instrument with which social aims become a reality. One aspect of preparing for school is to make the child feel confident and safe in a group. She also thought that some knowledge and skills are an advantage for the child to acquire before school. In this particular case, it was the themes of colour and form. She had structured her teaching with a type of lessons similar in a way to elementary school, although she used all the children's senses which is seldom the case in elementary school.

We have seen how she divided the whole into parts, with no connection with reality outside pre-school. Learning became a more or less meaningless activity for most of the children, something which had no value outside pre-school.

For whatever reason, it seems as if the structure of the situations in which a child is involved has implications for their way of thinking and this seems to differ from the teacher's intentions in relation to the acquisition of knowledge.

With regard to social behavior there seems to be a correspondence between the intentions of the teacher and the children's behaviour, but as noted above, not with regard to knowledge of these two themes. One explanation could be that social behaviour is regulated or talked about in relation to situations which happen in reality, in children's play with one another. Every child involved in a conflict had to give voice to his thoughts.

With respect to the themes, these were entirely structured and based upon the teacher's way of thinking. She therefore omits a number of connections with reality outside the teaching situations, not because she wants to make them meaningless to the children, but because, in her mind, these connections with reality are taken for granted. This is not, however, the case for all children.

6.2 The second study: traffic

This study is a replicat of the above but it has not been reported previously elsewhere. Since some parts of this study are fairly similar to the first one, and further description will shed no new light on the phenomena studied, these parts will be very briefly mentioned or omitted entirely. One aspect of reality which has become increasingly complicated for the child of today is a progressively more difficult traffic situation. Many children have to cross streets with heavy traffic on their way to or from pre- or elementary school.

> *Traffic is the largest threat to children's lives and health in Sweden. No illness or other type of misfortune kills and injures as many children. During the 1970's almost one thousand children were killed in traffic accidents.*
> *(Trafiksäkerhetsverket, 1981/Our translation)*

The traffic threat to children has been accorded attention in the new curriculum for elementary school where traffic education is a compulsory section (Lgr 80). Although this is no obligatory task at pre-school, traffic is a theme worked with almost everywhere. It was chosen as a theme then on the basis of its generality and its differing type of content from the themes of colour and forms. In the theme of colour and form there were concepts and relations to be understood; in the theme of traffic, concepts are not enough: children also have to understand principles.

The aim of this study is the same as the previous one in the sense of describing an educational process where the teacher's work and point of view constitute a background to the child's point of view. How is the teacher's written plan reflected in the thinking of the child when he is taught in pre-school?

6.2.1 Collection and analysis of data

One pre-school teacher and 35 children, divided into one morning and one afternoon group participated in this investigation. (Two children were not interviewed since one was partly deaf and one did not speak Swedish.) Nineteen of the interviewed children were 6 years old and fourteen were 5 years old. Some children were interviewed twice, so that there were 44 interviews to be analysed. Most six year olds had been in pre-school the year before.

The collection and analysis of data were much the same as in the previous study (see p. 62). The traffic theme was worked with for seven days in two separate groups of children, but with the same teacher and with the same content. The two groups are not in any way described separately since there was no significant difference either in the teaching process or in the children's conceptions of the studied theme.

6.2.2 The teacher's intention

This teacher's general intentions cover more or less the same areas as was the case with the teacher in the first study but, for various reasons, focus more on methodology. She believes that it is crucial to work with *social experience* as the situation arises. There are great many concepts to be worked with, concepts which constitute preparation for school, i.e. notions which facilitate the child's learning in elementary school (examples mentioned were comparison of similarities or differences, form-colour, traffic etc). For her, the "dialogue" method means to listen to the child's suggestions and show a natural respect for what people want to share of their thoughts. The teacher had had the opportunity of considering her view of knowledge and way of working, since she had been involved some years ago in experimental work to try and apply an educational technological perspective on pre-school activity. Following on this she realized that in order to change her work she had to change her way of thinking. She also learnt to work with smaller groups and to problematize her teaching by asking questions instead of telling the "truth". From different theories, many discussions and her own experience, she knew, she had to make her own commitment about the teaching of young children.

She raised the question of knowledge in children, saying that we often cheat ourselves into believing that they have understood more than they really have. It is not real knowledge if the child is unable to put what he has heard into practice. She maintained that it is essential to work with a small group of children to be certain of reaching everybody when there is important knowledge to be learnt. She also indicated the necessity of working concretely with material. And as she liked to sing and play, she used these activities a lot in her teaching.

The aim of the traffic theme was said to be to give children an understanding of how they could cope with the traffic situation.
She did not want to frighten them but make them aware of the risks and give them some respect. Notions to be worked with were traffic, vehicle, pedestrian pavement, crossing, parked cars, which side to walk on, where to play, right and left and reflectors.

6.2.3 The process of instruction

We will now summarize how the observed activities and situations were carried out.

The presentation of the theme started with a question in which the teacher play-acted and asked the children to guess what they were supposed to *talk about* this week. These first minutes of the theme represented in a clear way the climate of the theme as a whole. The teacher asked a lot of questions and the children were allowed to use their imagination quite freely. The children talked in a lively way, sometimes all at the same time and sometimes about rather unrelated things. But at a certain point the teacher broke the chain of free associations and asked them to speak one at a time or to talk about the topic, traffic; other discussions had to wait until after the "class-discussion". She formulated and reformulated questions until she received the correct answer. She seldom chose a particular child, but gave the question to someone who looked eager to answer.

In spite of the fairly free associations from the children, the teacher did have a teaching structure and there were new concepts about traffic brought up everyday. She also often said: "This is important for you to learn so you will not get involved in an accident". Teaching was made concrete via a flannelograph, pictures, an arranged traffic milieu and work with exercise papers, material for consumption and walks in small groups in the vicinity. During the walks there was a discussion about traffic all the time. Teaching of the theme varied considerably. Sometimes all the children were together, but in other situations, they were in smaller groups. The more important a topic was judged to be, the smaller the group. The teacher also intervened in children's play and listened and made comments about traffic.

The teacher stated that one way of teaching was to impress ideas on the child's mind via songs and nursery rhymes. This method was also used to a large extent. During the seven days with the traffic theme, there were not less than five new songs sung, and one nursery rhyme with a traffic content. It did not seem to be important for the children to learn the text of the songs. They were sung by the children who knew the text and the others hummed as best they could. They seemed to take pleasure in singing and suggested songs by themselves. A troll (hand-doll) was also used a few times to ask questions or tell a story.

The children were really enthusiastic and participated actively in all "class-discussions". The teacher always received a lot of response to her questions, since someone always knew. On the last day, everyone got a question each from the troll, but one third of the children could not answer.

6.2.4 The child's experience

All the children seemed active in the class-discussions and activities structured by the teacher. The tempo of the group activities seemed far higher than in the pre-school of the previous study. This could be explained by the fact that this teacher let the eager ones answer while the other teacher often tried to push the silent ones into the discussion. What was also characteristic of this pre-school was the teaching of class-discussions in small groups. The reason for this method was that the teacher wanted the more uncertain children to get a chance to talk.

6.2.4.1 The child's understanding of the teacher's intention

Almost every child said that he played and pottered in pre-school. What they described as their activities seemed to be very closely related to old sex-roles, where boys spend their time with gross motor activities and construction with lego (or similar material) or wood, while girls take interest in fine motor activities like sewing, weaving, working with pearls, or dressing up or playing mother or lady. Some children also said that they write in their "school-books". They describe *what* they did in these books, e.g. drew squares, showed which bike was different from the others; however, they did not know *why* they were supposed to work with these books, i.e. what they were expected to learn.

We see in the more general discussion at the beginning of the interviews that children talk a lot about what they do in pre-school. The children's first response to what they are involved in is, "doing". Many children do not conceive of the aim of pre-school as learning. Only 14 children mention learning and it is often the learning of a particular thing, e.g. doing something in school, being quiet and listening etc.Their understanding of the reason for being there was varied, but here, as in the previous study, the dichotomy between understanding the intentions of the teacher or not could be found (see p. 67). Let us now examine one question which was asked: "Why do you have to go to pre-school?".

Peter 6:5
S: To see if you're ready for school.
E: How do you see that?
S: If you're a rascal, you're not ready for school.

Sara 5:3
S: Because you have to.

Louise 6:9
S: Because mummy maybe has to go to work or has a lot to do so all the children are in the way.

Katarina 6:6
S: I don't know.

Daniel 5:7
S: Just because it's fun.

Helene 6:4
S: Because you learn things.
E: What do you learn?
S: You learn about traffic and different things that are important to do and not to do.

In these examples of children's ideas about why they go to pre-school, Sara (5:3) and Daniel (5:7) are excellent examples of referring to the situation as such, while Helene (6:4) is a very good example of having understood something beyond the situation, i.e. the acquisition of knowledge. Since this result is similar to the one arrived at in the previous study, we will not elaborate on it further. Neither will we add anything about teaching the Monkey what the child had learnt himself since there was nothing of interest which has not been covered in the first study (see p. 67).

6.2.4.2 The child's understanding of what is required to learn the content

In asking further about the activities of that particular day, the "class-discussion" was certainly not the first thing the children mentioned. What do children comprehend then of the content of the theme and "how" do they perceive it? The most notable feature in analysing the interviews is that, on the one hand, children say that they are too young to be by themselves in traffic, and, on the other hand, it is important to learn about traffic. Traffic is both dangerous and important! What in fact does traffic mean to them?

There was a distinction found in the previous study between the child's understanding of the content of the theme in terms of focusing on the situation (surface) or focusing on something beyond the situation (deep). The same distinction was found in this observation study, but since content differs from the previous one we will look at what this means in relation to this theme.

A Focusing on the situation

This category represents a narrow and superficial understanding of traffic. Traffic is more or less synonymous with crossing the street. In asking these children what they have been speaking about all week or when they had to teach the Monkey what they knew about traffic, everything they focused on was how careful you have to be when crossing a street.

> *Anders 6:4*
> *M: I'd like you to tell me everything you've learnt about traffic.*
> *S: You should stop at the kerb and look in both directions, and then you go straight across the street, and trains and buses and lorries and container trucks can be traffic.*
>
> *Johanna 5:11*
> *M: Why is it such a good idea to know all this about traffic?*
> *S: So you know what to do when you walk over streets.*
>
> *Lovisa 5:11*
> *M: What was said about traffic?*
> *S: You have to look very carefully and listen very carefully before you cross a street and three children abreast shouldn't go across at the same time.*

It is, in other words, the action of moving from one side of the street to the other which children perceive of as the main point in traffic teaching. They connect the place of crossing with this action, i.e. the crossing with "Herr Gårman" (Mr Walkman), or signals. Some children took "crossing" literally and did not think they were allowed to cross anywhere else. The teacher told them to go over close to a crossing since cars slow down there. Some children had noticed the chance to cross there but did not know why. Someone suggested that a bend was an advisable place to cross. Almost everybody had grasped the fact that they had to stop when there was a red signal. Only one child did not remember what colour he had to stop for, and said in addition that one had to cross when the top signal was visible. Most children also perceived that they had to look twice in one direction but only once in the other. But they knew only vaguely which direction to look in twice and why.

Someone suggested: "There are more cars from one direction than the other". Most children said that they have to walk on the left hand side. But to point out which was left or right was more confusing. According to Piaget, children are not expected to know and distinguish between right and left at this age, (Gruber & Vonèche, 1977). Most children seemed to know where to walk, on the pavement, but they also thought that they were allowed to bike there since they did it themselves. Many children know that there is a particular sign for "pavement" but quite a few confused it with the sign "Attention schoolchildren".

Concepts which, without any doubt, have confused children are *traffic, vehicle and pedestrian*. These notions are exchanged to the extent that one child even suggested that he was a vehicle when he was in the traffic. The concept of pedestrian passed by rather unnoticed. For many children traffic and vehicle were the same, namely cars, buses, bikes etc. This is quite understandable since this was more or less the way it was presented to them by the teacher. She asked the children: "What makes traffic?". Then she put up different vehicles on the flannelograph. What is also obvious is that traffic stands for cars: "many cars in movement". Cars that are parked or a single car do not seem to be conceived of as traffic for most of the children. A few children were able to describe the concept of vehicle as cars, lorries, etc, but most of them said that they did not remember, and some peripheral conceptions were also found as e.g. "vehicle has something to do with photography" or "speed measurement on cars" or "it has something to do with swear words". It was obvious that children had more difficulty in managing symbolic concepts than concepts which had something to do with action. Children had, in other words, the clearest conception about what they should do. They also knew when to use their reflectors since this was something they did at the time they talked about an action with the teacher.

One child took an interest in an illustration on the wall showing how road users often perceive children as grown-ups in miniature. The child understood the illustration as if it was aimed at showing "that adults could also be short".

In answer to how they knew now that they were able to cross the street, they referred to the fact that they had done it, or they remembered what the teacher said to them.

At the end of the theme, quite a few children said: "The teacher nags and repeats the same thing over and over again ... that you have to look carefully before you cross the street". Children who had not grasped the concepts of traffic, vehicle, pedestrian etc on the first interview occasion also failed to do it the second time after further teaching.

In reply to the question of whether they had learnt anything new, children who only concieved the action of crossing the street said as a rule that they had not. On the other hand, children who *could say* the new words worked with said they learnt something new, in spite of the fact they did not know the meaning of the words they said. Other things considered "new learning" were car makes that were sung about, and also a line in a song which went: Animals have the same problem in crossing the roads".

It seems that, when a child learns a new word, though the meaning of this word is not clear, he perceives it as if he has learnt something new. In asking the children who said they had not learnt anything new about traffic why they spoke about and worked with the theme, they said they did not know, or that there were other children who needed to learn about it. One child said "You can learn it better the more you talk about it".

The teacher used a troll (hand-doll) to tell a story in relation to traffic signals, where the troll was close to an accident and became very upset and cried. There was also an angry man in the story, however, and he was what the children perceived as the reason for the troll's reaction, and not the traffic situation as such.

With regard to the value of learning about traffic - and even though they are not allowed either to ride their bikes in the streets or be alone near busy roads, children say: "It is important to know". Reasons are: "When you are in elementary school you have to know", or "You have to know it to tell your children" and "You must know to get a driving licence". The children conceived adults being allowed in traffic above all because they are taller and see better. There are also explanations like: "They are allowed to because they have their own cars".

As we have seen, most of children's conceptions about traffic could be described as being focused on the surface of the teaching situations. But let us now briefly consider another aspect focused upon.

B Focusing on reality beyond the situation

This conception was rarely found in relation to the theme of traffic. To have a "deep" understanding of traffic means to have grasped traffic principles, e.g. the reason for looking twice to the left before crossing a street, or the relation between what the child has experienced in teaching and what this has lead to: a more general knowledge about reality, something to use their learning for more then "just do".

> *Lovisa 5:11*
> *E: What did you talk about in the group today?*
> *S: About having reflexes on in the dark so that cars saw you ... should be far down on all your clothes apart from your boots, where they should be as high up as possible ... because boots get dirty when you walk in puddles and when a car comes it doesn't see the reflectors.*
>
> *Helene 6:4*
> *E: What do you think is important about traffic?*
> *S: To help small children to find a crossing .. and blind people who've to cross the street, you can help them if you know where you should go and at what light .. it's such a shame if they're knocked down.*
> *E: Why is it good to know all this about traffic, do you think?*
> *S: Because you're afraid not to know and you never dare go out in traffic when you're a mommy and such like...*

The above examples are the nearest one can find to conceptions which reflect an understanding beyond the situation, i.e. that the child has acquired a "deep" understanding of traffic.

6.2.5 Discussion

The teacher's intention was to give children a certain respect for traffic as well as to prepare them to take care of themselves. Since where and how to cross the street was considered most important, this part of teaching was in smaller groups. It was in this particular situation that an emphasis was placed on the importance of looking carefully before crossing. This is without a doubt also what the children conceived. Although this does not constitute new learning, since supposedly every child has been warned by their parents to be careful when crossing a street, it is worth noting how concepts or situations entailing *to do* something are to the fore compared with more symbolic or abstract notions. The structure of teaching has been *to deal with the content in terms of action* and this has made a real impact on the children's way of thinking. Notions like traffic, vehicle, etc have only been words to the children. If they remember one of these words, they say they have learnt something. Memorizing is the children's view of learning, a fact also obvious in the interviews when these children said: "I do not remember".

The general system and principles of traffic are not traceable in children's thinking. It is the concrete action of being careful when crossing the street which is the result in children's minds after seven days of intensive work. This means that understanding of the traffic theme could mainly be seen as learning about the here and now, a replication of the situation - "cross the street". The coherent system of principles for understanding at a deeper level was not perceived.

6.3 Concluding remarks

This rather long and detailed description of themes worked with in pre-school was necessary in order to give a background to the rest of the study.

It could be said that most children attending pre-school do not see it as a learning milieu though there are children who do. *Children who perceive learning in pre-school do it in terms of acting or doing.* Most teaching is also structured from the perspective of doing. It seems as if teachers take for granted that, by working concretely with an activity, the child will then be able to acquire knowledge through action. It is the perspective of "learning by doing" which dominates the work.

The teachers' ideas of learning in pre-school also seem to be based on the behaviouristic perspective, where learning occurs by repetition. The action of doing and repeating is taken for granted by the teacher: it is never made explicit to the child. Perhaps one could characterize learning in pre-school as learning which will take place by itself if the teacher offers the child learning situations. Pre-school teachers, like other teachers in the field, never speak about learning: instead they say "now we will speak about ..." and then take for granted that children connect the telling to learning automatically. And of course, children learn, but what do they learn?

First of all, they learn *their roles as pupils* which means listening to each other, expressing themselves and waiting for their turn. Another aspect of learning is also closely related to the common role of being a pupil, i.e. to remember. Children should be able to do and label phenomena. The teacher has chosen concepts which the child is supposed to learn, although they have very little or no relation to the child's reality; thus the child perceives learning as more or less meaningless remembering. The phenomenon deal with becomes meaningless because of *the gap between the teacher's and the child's way of thinking*. The teacher takes many relations for granted while these relations are not obvious to the child.

Let us now emphasize and summarize what is of greatest interest in these observation studies. By analysing child interviews in the light of the teaching with which children have been confronted, we have *noticed the dichotomy between a deep and surface approach* which has been previously described in relation to adults' reading of a text (see p. 36). "Deep" and "surface" approaches were originally seen as different intentions or orientations to learning. In this study we have no information about children's intentions or approach, so we must proceed via the result, namely *children's understanding, from which we make conclusions about the children's approach*.

We must indicate one more difference in this study compared with how these terms "deep" and "surface" approach were used earlier. Instead of a text, the *learning situation* in itself is here considered in a way which is analogous with how the text was viewed in previous studies.

Having made these adjustments to the original idea of "deep" and "surface" level of approach, distinctions of a similar kind can be noted. At the surface level, children approach learning from a "here and now" perspective, i.e. learning is the situation as such - *to do*. This means that the child learns to repeat the colours, make forms or cross the street. At the deep level, children approach learning via the situation, i.e. learn about the reality beyond the situation. This means that children learn more in general about what these examples in teaching refer to outside pre-school. These children can see coherence in different situations.

The "roots" of the distinction between the "deep" and "surface" approach have been found here. The background of this dichotomy in children's thinking will be illuminated in the main study, in which the children's way of thinking about learning will be developed in detail.

PART II. THE EVOLUTION OF THE AWARENESS OF LEARNING

7 BACKGROUND AND METHOD

Our theoretical background was dealt with in chapter 2. However, since there are some differences in interpretation, especially as far as the domain of metacognition is concerned, we wish here to state our position in a short theoretical introduction to the second part of this book.

The main purpose of the present work has been to trace the development whereby children become conscious of the fact that they can learn, and to describe the qualitatively different forms that their ideas of learning subsequently take. The primary stress is on the identification of different conceptions of learning and these will be presented here as the main result of the studies.

The discovery and description of children's conceptions of the phenomena of learning produce results of a qualitative nature. *These qualitatively different categories of conceptions should be seen as the main result.* The other type of result is of a quantative kind. *The quantitative results account for the extent to which these categories are to be found at different levels of development.* If we look at the two complementary results in terms of "figure and ground", the varying qualitative conceptions described in categories constitute "figure", while the frequency with which these are to be found constitutes "background".

7.1 Definition of awareness and metacognition as it is used in this investigation

Metacognition can be characterized as awareness of one's own cognitive function. Awareness is a wider notion than metacognition, which means that one is conscious about the world around. However, when awareness is focussed on the cognitive aspect of one's existence then we are dealing with metacognitive awareness. This means in relation to learning that awareness and metacognition are two indistinguishable aspects of the same phenomenon.

Lunzer (1979) has designated three different types of consciousness:

> 1. *Consciousness implies differential reactivity and no more.*
> 2. *Consciousness would seem to imply some sort of internal organisation mediating an equivalence class, an organisation which might be thought of as a concept, a recognizer or a scheme, depending on the reader's preference.*
> 3. *Consciousness implies that the object of cognition can be attended to by the subject and can therefore become an object for voluntary representation or for verbal communication.*
>
> *(p. 2)*

With regard to this investigation, it is Lunzer's third level which is in focus. This means that the child has to elaborate and verbalize his awareness of learning in a way which is interpretable. The child has to be able to look at his own learning and reflect upon it. One could say that, within the metacognitive task *to think and reflect upon his own learning* implies a consciousness which has implications for the child's ability to reflect.

Metacognition and consciousness are central notions in this study about conceptions of learning. But there is a need to stress the difference between the dominant meaning of metacognition and the approach adopted in this study.

Researchers working in the area of metacognition think mainly in terms of:

a) The individual child has a *representation* of the world stored in his mind. As a consequence, a conception will be a capacity of the child.

b) The individual child also has some kind of *device operating* on that representation. This could be characterized as processes going on inside the child, which have consequences for his actions in different situations.

Metacognitive capacity is frequently seen as originating from a structure belonging to the child's intellectual make-up. Fischer and Mandl (1982) describe two models of metacognitive regulation: Flavell's knowledge-based and Brown's operation-based views. They summarize:

> *Flavell's concept of metacognitive knowledge is explicitly based on the assumption of awareness, if not to say that metacognitive processes are due to consciousness if they are to work at all. The more elaborate and differentiated the metacognitive map of one's cognitive endowment, the more likely it would seem that this elaborate grade of reflection (about reflections) would also have a corresponding counterpart at the level of cognitive performance. Thus, Flavell predicts performance on the basis of competence which is reflected in the self-statements of the subject. In Brown's earlier work (until about 1978) executive components of skilled behavior are isolated and differences in executive skills are inferred from differences in actual performance. Training of executive skills leads to improved competence, for example flexible use of (strategic) rules or spontaneous transfer or generalization of a rule to new kinds of tasks, but what constitutes competence is not mentioned at all. Brown's later work, particularly the "tetrahedral model" in Brown, Campione and Day (1981) does take into account differences in competence between good and bad learners to the extent that domain-specific prior knowledge, knowledge concerning the state of one's own cognitive apparatus, as well as knowledge about one's own strategy repertoire is given a role for the explanation of differences in performance, although naturally, no competence data are being collected.*
> *(p. 341)*

The view which is referred to here and which means that metacognition is seen in terms of a capacity or performance of the child, is the dominant view.

Metacognition as it is approached in this study could be characterized as thinking about the relation between the individual and the world around him. The situation which the child is involved in as a whole creates a structure. We are not dealing with mechanisms behind conceptions, but with the description of different forms of conceptions of the phenomenon of learning. This means that metacognition from this point of view has to be seen as a *metalevel of the child's conception of the world around.*

him, as it becomes verbalized in an interview situation with regard to the particular questions asked. We will return to this in the description of the results.

The main results, the qualitatively different levels of conceptions of learning found in the age group between 3 to 8, will be described as expressions of the child's way of thinking about learning.

7.2 Methods of the interview studies

We will now describe more specifically the methods employed in *six interview studies* constituting the basis of the main findings of this thesis. The five first studies are to be seen as pilot studies and the sixth as the main interview study.

7.2.1 Questions

The design of the study as a whole is related to the fairly problematic task of conducting interviews with children. The choice of questions to be asked is in itself a difficult task. Thus what we have done in the five pilot studies is to develop questions; we have used certain questions which we believed were good. Some questions worked, while others did not. This means that some questions were utilized further in the next study, while others were changed. This was the procedure in all five first studies. This means that the *questions in the sixth study can be seen as the results* of the previous studies (these can be seen in appendix 2).

We are convinced that to find out children's conceptions by interview one has to proceed in a similar way to ours, since it is a fairly problematic task in which no adult can sit down and invent questions which work immediately.

As indicated previously, there are two kinds of results: qualitative, the categories in terms of which we try to characterize children's conceptions; and quantitative i.e. to what extent the conceptions exist. In the first mentioned kind of result, we have been able to depend on interviews from all the studies, and these will constitute illustrations here. In the second result-type, where it is a question of comparing over levels of age, there must be a basis for comparison, and consequently we have been able to use only the sixth study.

7.2.2 Subjects

The total number of children participating in these six interview studies was 276, distinguished in different studies as shown in table 2 below.

Table 2. Children participating in the interviewstudies.

		number of children	variation in age
Pilot study	1	35	3:8 - 8:1
	2	25	5:4 - 6:11
	3	32	3:3 - 8:3
	4	25	3:11- 7:6
	5	10	4:0 - 5:0
Main study	6	149	2:9 - 8:8
Total		276	

Since in the main study we compare different levels of age, a more systematic choice of children has been made in this study as shown in table 3 below.

Table 3. Children participating in the main interviewstudy (the sixth study).

Age	Total number	Girls	Boys	Variation in age	Average age
3	13	8	5	2:9 - 3:5	3:1
4	28	14	14	3:8 - 4:7	4:2
5	27	13	14	4:8 - 5:7	5:3
6	27	13	14	5:8 - 6:7	6:2
7	28	14	14	6:8 - 7:7	7:2
8	26	14	12	7:8 - 8:8	8:2

The children participating in the main study have been selected by means of a two-step procedure. First, a number of pre-schools were chosen in Göteborg and its surroundings. These were supposed to represent the whole range of different types of housing areas. Our intention was to pick preschools in which there was a reasonable match between supply and demand for places. Would the latter considerably exceed the former - which is frequently the case - due to the priority rules for admission, children with social problems would be overrepresented. Second, within each preschool an equal number of boys and girls were selected at random.

7.2.3 Interviews

In the beginning of the pilot studies it was thought to try to keep the child in his natural setting in the same room as other children. The idea was that the child should not feel inhibited, but be as relaxed as possible. This proved unnecessary. Children were very interested in coming into a particular room, and spoke in most cases very freely. In two cases children did not willingly participate but as a rule there was a queue among the children to participate in the interviews. The interviews which were carried out individually lasted around 20 minutes (within a variation of 10 to 35 minutes). The interviews were taped and later transcribed.

Although there was a fixed group of questions in every study, these questions could not be formulated in exactly the same words, since the idea was to be sensitive and follow the child's thinking. It was, in other words, necessary to ask questions which the child would understand (for further explanation see p. 47).

The large variety of ages of children participating in the interviews means, of course, that they understood and consequently were able to answer questions to a different extent. Due to the fact that there is a gap of more than five years between the youngest and the oldest child, there had to be an increase in difficulty in questions. As a consequence, younger children received fewer and easier questions, while the older ones were given qualitatively more difficult questions and more of them. Thus, the interviewer had to know when the child had nothing further to elaborate. In reality this often meant that the child had some questions which he was not able to answer between questions he was able to figure out. In this way the child did not have to feel a failure as a result of the interview, and the interviewer obtained a fairly stable picture of when to finish the interviewing.

7.2.4 Analysis

During analysis, the interviews were read and re-read until something interesting to the purpose of the study become visible. After an idea of the children's conceptions had been acquired the interviews had to be looked at in a more systematic way. As a consequence, the total picture was modified, and the same procedure had to be repeated again quite a few times.

Generally it can be said that conceptions of learning which arise in talking with children form a complex pattern. This complex pattern of thinking can be analysed from a structuralistic or a content-focused perspective. But since we believe that logic is not a capacity built in the child, but a relation between the child's way of thinking and the content on which thinking is focused, we have to take the structure as well as the content into consideration.

Following the above, the interview as a whole has to be the basis of analysis. This means that whenever a child gives expression to a particular conception it has to be considered. The single answer has also to be looked at in relation to the interview as a whole. Explicitly expressed, every conception a child expressed in the interview as a whole will be categorized[6].

After identification and description of categories of conceptions appearing in the interviews as a whole, each child's conceptions were categorized. All available information from the child was utilized, but in relation to specific problems, specific questions came into focus (we will make these questions explicit where this is relevant in the description of the results). After categorization of all the interviews, a reliability test was carried out with 30 randomly choosen subjects.

Once judgement was made for each child. Whether or not he could be said to have expressed the different conceptions, a comparison was made on the group level with regard to the frequency of these conceptions at the various age levels.

Let us now look at the results of this investigation, which will be presented in three parts:

1. *What is learning*, dealing with children's understanding of learning as a whole.
2. *The "what" aspect of learning*, dealing with what the children perceive as learning.
3. *The "how" aspect of learning*, dealing with children's ideas of how particular learning comes about.

In the following three chapters (8, 9, 10) the results of the interview studies will be developed, and in the last chapter of this part (11) the main findings will be summarized.

We have previously referred to Säljö's (1982) and Dahlgren & Pramling's (1981) studies concerning conceptions of learning by adults. In these studies, the subject had to answer general and direct questions about knowledge and learning. As the subjects in this study are young children, the above kinds of questions can only be used to a very small extent.

In the pilot studies attempts were made to ask children about what it means to learn. Questions were directed in different ways but it was shown fairly soon that it was impossible for them to answer. This is quite understandable since to be able to answer such a question requires an explanation of a phenomenon, and it is rather difficult for children at the age levels of this investigation to make such explanations. Despite problems with the explanation of the phenomenon of learning, 23 of the oldest children (8 years old) in the main study got a direct question to be explained. The question asked was:

> *In this day-care centre there are also younger children, and as you know they do not always know what something means. Let us suppose one of these two or three-year-olds came up to you and asked 'what does it mean to learn?' What would you tell him?*

Twelve children who could not give a relevant response either said that they did not know or gave answers which were interpreted as irrelevant e.g.

> *Claes 8:1*
> *You know when you do it, because you think about it.*
>
> *Jenny 8:0*
> *You learn that in school.*
>
> *Camilla 8:8*
> *You learn a lot before you're grown up.*

These, and similar kinds of answers show that these children are not able to explain learning in general. But let us now look at the eleven children who were able to give a relevant answer. What do they in fact say?

> *Cecilia 8:2*
> *I would say you know things when you've learnt something. That you know the things you have learnt.*
>
> *Maria 8:4*
> *I don't know .. I would maybe say that you just think of it or something like that. That you learnt it or so.*
>
> *Valentina 8:1*
> *For example you learn how you cut yourself. I don't say that but how you learnt to skip with a rope .. Then I show how ..*
>
> *Niklas 8:0*
> *I don't know .. well, that you think better ..*

Johan 8:6
I don't know .. maybe that you learn. You can ask someone who knows what it is. Then maybe you find out about it.

Hanne 8:1
That you learn to read so you can do it.

Malin 8:7
That you can learn .. if someone comes and asks 'can you teach me to swim' .. yes. Do you know what you do them. And then I took his legs and arms ..

Jenny 8:2
Well .. you practice and practice and in the end maybe you understand something and then you've learnt.

Katarina 8:3
That it was when you learned to understand, like. That you understood things and then you, like, know those things.

Henrik 7:8
Yes then I'd have said, for example how fish manage without air, I would say, that they have something in their bodies that does it.

Robert 8:6
S: I don't know what I'd say. Don't know.
E: Now let's pretend that I'm 2 and I ask you Robert what you mean by learning something.
S: Then I'd say that perhaps I'll read a book for him so he wants to listen to that book.
E: What does he learn then?
S: I don't know. Could learn something out of the book.

Most of these answers are elaborated to a limited extent. They are also of different quality but considering the eleven answers as a whole one could summarize these children's view of learning as: LEARNING IS BECOMING (MORE) ABLE BY EXPERIENCE[7].

It is important to stress, however, that these answers only consist more or less of fragments of the notion of BECOMING (MORE) ABLE BY EXPERIENCE.

If we now look at this expression we may discover that it can be broken down into two components. Firstly, there is the question of *what* happens when one learns. The answer is that one BECOMES ABLE (to read, to swim etc) or that one BECOMES MORE ABLE (to think). Secondly, there is the question of *how* learning comes about. The answer is that it takes place by EXPERIENCE (by practice, by doing it etc).

The "what" aspect of learning is expressed by some children in terms of TO DO (e.g. Malin (8:7). Henrik (7:8), and Robert (8:6)). Answers are interpreted as if these children give examples of how to get TO KNOW something, in one case how fish can be in water without air, and, in the other case, to get information from a book. These children are not given an explicit definition, but their statements have been interpreted as if they think of what it means to learn in terms of TO KNOW. The third way of accounting for the "what" aspect of learning is in terms of TO UNDERSTAND (e.g. Katarina 8:3). The eleven children thus deal with learning in terms of its two related aspects; *what* they learn and *how* they learn. Some children mention both aspects (e.g. Valentina 8:1, Jenny 8:2), and others only mention one of these aspects (e.g. Hanne 8:1, Katarina 8:3, Niklas 8:0).

As pointed out here, the answers vary with regard to both components of learning. These related aspects, the "what" and the "how" of learning will be returned to.

The essence of learning as children describe it in terms of BECOMING ABLE is also how Freudenthal (1978) defined it when he described how his grandson Sebastian (3 years 11 months) became aware of the essence of learning:

> *One afternoon I pass our Geological Institute with Bastiaan (3:11) and tell him that two of his uncles had studied there. As he does not know the word, I explain to him that studying means learning. He asks what is the use of it. I lecture him about learning preceding being able. All of a sudden he ejaculates the words: "I can cycle". Like all children he got much too early one of those badly constructed pedal vehicles for the little ones, but eventually, just this morning he grasped the trick of transforming the treading movement into a rotation. He was excited, and now this excitedness is enhanced by the comparison of his own learning with that of his uncles. Not only does he learn but he has discovered learning in its essential functions: learning in order to be able to.*
> *(p. 187)*

Let us return to the children in this investigation. We have now seen how difficult it is also for an eight year old child to explain what learning is. What must we now do? We have indicated that learning consists of two aspects; a "what" and a "how" of learning. This means that when children are not able to deal with learning as a complete notion, it has to be dealt with as one of these two related components. Thus, either "what" or "how" has to be the focus of the question the child is asked. In talking about "how" to learn, it must always be in relation to a particular "what" brought up either by the child or the interviewer. Hence, by talking about one aspect at a time, we make it an easier task for the child to deal with the conception of learning.

9 CHILDREN'S IDEAS OF THE "WHAT" OF LEARNING

Let us now focus on the first of the two components of learning, i.e. *what* children perceive as learning. Which of the situations and activities in which a child is involved does he choose to define or label as learning?

The main idea in trying to find out what learning means to the child has been to get him to *suggest something himself*. Thus, in the main study, questions used were:

> Tell me something you have learnt.
> Tell me something you learnt at pre-school (and in the class-discussion).
> Is there something your teacher wants you to learn?
> What are you going to learn when you start primary school?
> (See appendix 2 for all questions in the main interview study.)

We are interested in what the child says spontaneously; in the terms they choose to talk about learning. To avoid tediousness the questions above incorporating the notion of learning were varied with other kinds of questions. The description and categorization of the child's idea of the "what" aspect of learning has always been derived from questions in which the word learning was used. The "how" aspect was omitted for the time being.

There were also other questions suggested by the interviewer and considered in the analysis and categorization of the "what" aspect of learning. In these questions, the "how" aspect of learning was fixed or "taken for granted". In other words the interviewer suggested "how" one could learn something and the child was supposed to suggest "what" to learn. The child was asked questions such as:

> Have you ever learnt something from watching television?
> Have you ever learnt something from reading books?
> If the child was not able to read himself, the question was changed to:
> Have you learnt anything when someone read a book for you?

In these questions the interviewer more or less implied that one way to learn is by reading or watching television. The purpose is not to see whether these children can remember something they have seen or heard, but whether they are able to relate these media to a learning situation and, if so, what kind of learning they relate to these media.

Let us now look at the results of what children suggest in relation to the "what" aspect of learning. What children perceive as learning will be described in qualitatively different categories. Children express learning activities in three main ways:

LEARNING TO DO
TO KNOW
TO UNDERSTAND

These categories could be seen in the previous chapter where the oldest children had to explain learning. The categories will now be developed and illustrated further using the increased data base below.

As shown later in the quantitative part of this chapter, it is the category of LEARNING TO DO which is by far the most frequent.

There is a further differentiation within this conception, as can be seen in figure 2, where we show the structure of the system of categories found to reveal the child's understanding of the "what" aspect of learning. This is a summary of the first part of our main qualitative results. The various categories of description will, of course, be elaborated further in the subsequent sections.

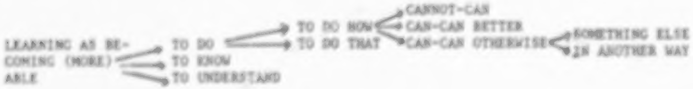

Figure 2. Learning as becoming (more) able

9.1[8] Learning as becoming (more) able TO DO

The conception of learning as TO DO is a conception which almost every child expresses. Although one can find more advanced conceptions of learning in an interview, one can always find the aspect of learning in terms of becoming (more) able TO DO.

There is a large variety of manual skills, activities or behaviour constituting examples of what children perceive as learning under the category of TO DO. According to Piaget, children develop their ways of thinking by acting; by having concrete experiences (see p.18). The most concrete experience one can be involved in is when one does something oneself. Many senses are involved when the child does something and hence this is the situation they relate to the notion of learning. Children never introduce examples which would be labelled as a process of maturing by most grown-ups, like i.e, sitting, walking etc. Children are involved in a lot of doing, but not all these actions are labelled as learning. However, most examples of learning are actions.

Since the "what" aspect of learning in the category of TO DO is always possible to categorize either in terms of learning HOW TO DO or TO DO THAT, this will be elaborated further with examples under these headings.

9.1.1 Learning as becoming (more) able at HOW TO DO

Instances of learning in this category can be *manual skills or activities* which the child has learned, is learning or is going to learn. They can be skills in which the whole body is involved, i.e. turning somersaults, swimming, jumping, riding a bike etc. In many of these activities there is no equipment involved (except the bike). Another group of skills are activities in which some kind of material is used, and where in most cases only a part of the body is involved, i.e. waving, making pictures from plastic pearls, drawing or writing etc. The last group of skills mentioned by children as examples of learning HOW TO DO are activities related to the brain, or what we normally label as intellectual skills, i.e. reading, counting, singing songs, speaking words in other languages etc. Most of these activities are related to verbalization.

What all these skills or activities have in common is that they represent something one can do. It is a technical aspect of learning, where TO DO is in focus. Some examples of the above description of learning are outlined below:

> *Anders 3:8*
> *E: Tell me something you've learnt?*
> *S: I've learnt to use the pedals on my bike.*
>
> *Ninnie 4:8*
> *S: I've learnt to write sixes, shall I show you?*
>
> *Lars 3:11*
> *E: Tell me something you've learnt?*
> *S: To build Lego.*
>
> *Jonas 4:1*
> *E: What have you learnt?*
> *S: To box.*
>
> *Pia 8:0*
> *E: Tell me something you've learnt lately?*
> *S: Not so long ago I learnt to dance folkdances in school. We do it once a week. I've chosen this, someone else has chosen pottery and so on ....*
>
> *Linda 7:6*
> *E: Tell me something you've learnt?*
> *S: To play the flute, I got one the day before yesterday.*

It is important to stress once again that phenomena like reading, counting, speaking English etc are categorised as an action, since the interpretation is that these phenomena from the child's point of view are skills of doing. When a child, for example, talks about learning to count at this age level, he means either, to rattle off numbers or to count without full understanding of the process. Just as a child can rattle off numbers, he can also recite letters as below:

> *Martina 6:4*
> *S: I'll tell you something I've learnt over the weekend.*
> *E: What's that?*
> *S: The alphabet, do you want to hear: A B C D E F*

The interview with Martina continued for a long time and it became obvious that she did not realize that letters and the alphabet were the same thing. Neither did she know what to use the alphabet for, and finally she exchanged it with numbers.

When children choose to give an example of words learnt in a foreign language, this is categorized as learning TO DO. Such examples are judged in the same way as being able to sing a song or tell a story by heart. They have memorized something which they can repeat.

Another category should be mentioned here. When people talk about where they live or what date it is today, it is usually labelled as knowledge. But knowing about pre-school settings where children's names, addresses and the calendar are talked about, and knowing about the child's way of thinking, this means something else to the child. The interpretation made here is that learning the calendar (i.e. the days of the week) or one's address, means to be able TO DO it, e.g. to *tell it*, and this is the same kind of technical aspect as talked about previously with regard to counting and reading.

> *Henrik 7:4*
> *E: Do you learn anything in the nursery?*
> *S: Yes, we learn what things are called .. for example, where you live and that ..*

The group of questions suggested by the interviewer and dealing with learning from media (a book or television) should also be mentioned. These were questions (p. 92) in which the order (of "what" and "how") was changed. Instead of first asking the child to give an example of something he has learnt and then asking him "how" he learned it, the interviewer suggested a way of learning (i.e. through a medium) and asked the child to give an example of "what" he learnt.

If we omit those children who failed to answer or gave irrelevant answers, there were two kinds of response: to learn *about* something or to learn TO DO. The latter will be categorized here.

A few children referred to the handling of a book or managing to work the television, i.e. switching on and off. In this case the child responds in terms of learning TO DO something *with* and not learning *from* the media.

> *Anna 4:4*
> *E: Have you learnt anything when you watched TV?*
> *S: Mm.. to put it on.*

Another response to the question categorized here is learning to read or to do something else from the media. This will be outlined further under the "how" aspect of learning. One example will suffice here.

> *Julia 7:5*
> *E: Can you learn anything from reading books?*
> *S: Yes, you can learn letters .. can read words.*

One could say that there are many aspects of learning in terms of HOW TO DO, depending on the content of the child's conception of learning. But whatever the content, the common base is a manual skill or an activity, in other words an action.

In relation to the question *What are you going to learn in primary school?* the prevalent response was to learn to read and write. The purpose children gave for learning to read (which was often focused upon) was different. The most common reason had to do with the adult world, i.e. reading could be seen as a *must* for getting a job or because perhaps their own children would want them to read aloud. A second idea of the purpose of reading was defined as being able to *read if someone asks them to.* Finally, there is the idea of being able to read a letter or other message. In the main, however, the value of reading is not related to the here and now, but to the adult future. The idea of being able to acquire knowledge via reading never arose[9]. This brief description of the purpose of reading is incidental in not being systematically categorized within the focus of this investigation. It is nevertheless interesting in showing how far away the child's perspective is from the adult's.

The conception of learning as becoming (more) able at HOW TO DO was found to be differentiated into three further categories concerning the type of transition between two states: from not being able to becoming able (from CANNOT to CAN), from becoming able to becoming more able in a quantitative way (from CAN to CAN BETTER) and from being able to becoming more able in a qualitative way (from CAN to CAN OTHERWISE).

9.1.1.1 Learning as a change from CANNOT to CAN

When children talk about learning in terms of HOW TO DO, they sometimes give spontaneous expressions of a change in their learning: they perceive it as if there was a situation or time they were not able TO DO something, but later or suddenly they became able.

Li 4:10
E: Have you learnt to do up buttons?
S: First when I tried .. quite difficult jeans for Stefan I couldn't but then I could and I learned to button like this ..

Nick 6:10
E: Can you tell me something you learned at pre-school?
S: To read and write ..
... after I'd learned I went and played.

Jessica 5:7
E: Have you learned anything at the nursery?
S: I've discovered how to lay a jigsaw puzzle, I couldn't do that when I was 5.

In the answers above, the change from CANNOT to CAN is rather explicitly outlined, but it is not always like this. A conception is categorized here as soon as a child is able to tell what he has learnt without a period of transition or practice.

9.1.1.2 Learning as a change from CAN to CAN BETTER

Conceptions categorized thus reflect an *improvement* in the action which the child talks about. The child sees he was able to TO DO something, but learning makes him more able to do it. The child's conception can be an expression of both a quantitative change, like learning *more* of something, or a qualitative change, like learning something BETTER. The notions of "more" as well as "better" represent an increase in the child's learning[10].

Ulrika 8:0
E: Isn't there anything you've learnt at school?
S: Yes, I've learnt more things I already knew, but I've learnt to read better and that ..

Susanna 5:10
E: But do you think you can learn to swim better?
S: I think it is much better to learn to swim calmly from the start but later when you know a lot you can of course swim fast.

Daniel 7:10
E: What will you learn in school?
S: To read .. and learn to count a bit more. And learn to read better and all the A B C D which I don't know (the letters)

Susanna (5:10) is asked by the interviewer about being able to swim better, and she says that one has to take it easy at first, but later on one can swim faster. In other words, when one is able to, one can improve one's swimming and become BETTER.

9.1.1.3 Learning as a change from CAN to CAN OTHERWISE

The child knows that there are qualitatively different ways of being able TO DO something, and he expresses learning as a qualitative change. This means that one can improve learning by learning to do SOMETHING ELSE or to do SOMETHING IN ANOTHER and BETTER WAY. If a child answers in accordance with this category, the answer can always be described in one of the two sub-categories in which CAN to CAN OTHERWISE is divided, namely as a transition to doing SOMETHING ELSE or to doing IN ANOTHER WAY.

9.1.1.3.1 CAN OTHERWISE as learning to do SOMETHING ELSE

This conception characterizes a qualitative change in what the child suggests. The child has learnt HOW TO DO an activity or skill, but because of further learning he has learnt HOW TO DO something more than previously, something more advanced.

Henrik 7:4
E: Can you learn to swim faster then ..
S: Swim faster .. I don't know .. You can do the crawl, then you do it a bit faster like

Eva 6:6
E: When you've learnt to swim so you don't sink, can you then learn to swim faster?
S: I don't know.
E: Do you think so?
S: No, you can probably learn to dive.

Linda 6:5
E: Why go to school then?
S: Just to learn things.
E: But you can just as well learn at home. You've already learnt to read and write.
S: Not the highest figures and not the most difficult words.

9.1.1.3.2 CAN OTHERWISE as learning to do IN ANOTHER WAY

A conception placed in this category must reflect a qualitative change in learning about the same phenomenon. One learns HOW TO DO something in a different way than previously, though the learning situation in itself is the same.

Catarina 7:10
E: But what have you learnt in school if you already knew the alphabet?
S: Religion and that, I didn't know that before .. I had looked at the bible and that but I didn't really understand.

Kalja 7:3
S: I can read for myself better than her.
E: How have you learnt to read to yourself then?
S: It is the same as reading aloud but you think about what is in the book like this: Lisa is clean because she has washed herself.

Sometimes one answer can express both the categories described, for example:

Julia 7:5
E: Is there anything you know now which you did not know when you started school?
S: Yes, to do different sums, maybe that I did not know .. I wrote 4's backwards then.. but now I write like you should.

Julia says she can do something now which she could not do previously, i.e. write sums, but she also says that she is better at writing the figure four, having written it the wrong way before. Thus, a conception like this can be categorized in both the category CANNOT to CAN, and in the category CAN to CAN OTHERWISE. This phenomenon is not unusual with regard to other categories as well.

Some reflexions about continuity

In the last five categories describing a change in learning TO DO, there is an obvious hierarchical structure, beginning as an implicit part of the activity or skill the child has learnt. Thus, if the child himself expresses learning in a way which is to be interpreted as HOW TO DO it is implicit in the statement that the child can now do something which he could not do previously. In the following categories one can discern a successive increase in learning HOW TO DO in terms of quantity as well as quality. This means that these categories represent the most advanced levels of conception.

In summarizing the categories which show some kind of change in the "what" of learning, one must stress that these answers are sometimes spontaneous expressions in relation to a learning situation and sometimes questions directed by the interviewer as a follow-up of the learning situation talked about. Questions could be e.g. How would you go about becoming more able ....? Is it possible to learn to run faster, play better etc?

The purpose of following up the "what" aspect of learning has been to see if children at these age levels have *any conception of continuity* in relation to learning, i.e. whether they can see a progression in learning HOW TO DO.

In the pilot studies there have been various questions aimed at getting information about children's conceptions of continuity. This has been difficult, but one question put to 25 children between 4-8 years of age reveals some ideas. The question was "When do you grow?". These answers will not be categorized as they are not central in this investigation, but some examples of children's ways of answering the question will be given:

Anna 4:7
E: I'd like to know when you grow?
S: I grow the 15th of April when Petra has her birthday.
E: Do you grow when Petra has her birthday?
S: Hm, you can, but it takes a long time.

Emil 5:4
E: When do you grow?
S: Every time I have a birthday.
E: How much do you grow then?
S: A centimetre or so .. first I was one centimetre .. no you can't be that .. yes in my mummy's tummy .. first I was one centimetre when I was small and then when I had my birthday I was 2 centimetres and three roughly and then ..
E: Do you grow every time you have your birthday?
S: Yes and I am about 90 centimetres
E: I see, do you see that you grow that day?
S: Hm, no I don't see it but I notice because I have my birthday.

Sara 5:8
E: When do you grow?
S: you don't see when you grow, you grow so slowly I don't see when I get bigger and bigger
E: Do you get bigger and bigger. But when?
S: Well every year you get taller and taller, so you grow every year. You grow so slowly that you don't see it.
E: Are you growing now?
S: Yes, you grow all the time.
E: At night too, when you're asleep?
S: Yes.

Ulrika 8:0
E: When do you grow?
S: Yes well, you grow at night and during the day.
E: How much?
S: You always grow a little.

We see here a varied response to the question of growth, from once a year, to occasional and finally constant growth. One can see a progression with the age of the child in the examples towards the understanding of continuity. This was not entirely true, however, since in one pre-school there was recently a teaching situation in which the children were taught about growing and where younger children also knew that they grew all the time though could not explain the matter further.

9.1.2 Learning as becoming (more) able TO DO THAT

Conceptions of learning categorized under the heading TO DO THAT are in most cases related to the *social behaviour* of the child. The child perceives that it is expected or necessary to do or not to do something in a particular situation. He already has the skill, but *in a particular setting he has to use it*. A social or physical setting can involve some kind of demand or expectation to DO THAT.

> *Martin 4:10*
> *E: What do you learn at the day-centre?*
> *S: Traffic.*
> *E: What do you learn about traffic?*
> *S: That you can't go over the street when the light is red.*
>
> *Roland 5:7*
> *E: Do you learn anything at the pre-school?*
> *S: Yes, that you should not shout for the teachers get sore ears then.*
>
> *Sara 6:8*
> *E: Tell me something you have learnt?*
> *S: To sit still in the group.*
>
> *Anneli 4:4*
> *E: Do you think the teacher wants you to learn something?*
> *S: I have learnt to eat, how to do.*

Martin (4:10) is already able to walk across the street, but now he knows that he is not allowed to do it when there is a red light. Anneli (4:4) talks about learning to eat, which could be a skill and labelled HOW TO DO. What she means, however, is that she has learnt to behave properly at the table.

Behaviour at the table is often perceived as a learning situation. This is also most probably how it is in reality. Ehn (1983) stresses the eating situation as a critical one in which the teacher, and subsequently children, foster each other to behave in a particular way at the table, with the intention of providing the order necessary for a functioning group. Order is, according to Ehn, one of the most important aspects of pre-school culture, with a wide symbolic meaning for children.

Let us now leave learning in terms of TO DO and look at learning in terms of the more advanced level of conception, being able TO KNOW.

9.2 Learning as becoming (more) able TO KNOW

The child's understanding of learning as categorized here is of a relational kind. This means that learning is seen as gaining *knowledge about something* in the world around. This conception of learning represents an intellectual skill, in which learning for the child is to have something in his mind. Learning in terms of knowledge means that the child has perceived something which he is able to verbalize and tell someone else. He has acquired knowledge from the world around him and he sees this knowledge as a result of learning.

For questions used as a basis for this categorization, see p.92. These questions were all related to learning, but in some of them the "how" aspect was fixed. With regard to the question of learning from books or TV, it was not enough for the child to say, e.g. "Yes, I have learnt from looking at television", for his answer to be categorized under this heading. The child has also to give an example of "what" he has learnt. This means that learning must be explicitly expressed in terms of knowledge about something or someone.

> *Henrik 7:4*
> *E: Can you learn something from reading books?*
> *S: Yes, I have a book about how things were in the past.*
> *E: How come you've learnt about that?*
> *S: I've learnt from books.*
>
> *Fredrik 6:4*
> *E: Can you tell me something you've learnt?*
> *S: I know how a bike works. And on those bikes out here there are no chains. And you can't brake, you have to bike backwards. So a bike works when you bike and when you pedal backwards it stops.*
> *E: How come you know so much about bikes?*
> *S: Daddy's taught me once, when we were going to repair my saddle, I asked a bit in that bicycle shop.*

Here, as elsewhere (see e.g. p. 98) one answer could express conceptions belonging to different categories. Let us look at an example.

> *Li 5:9*
> *E: Tell me something you've learnt.*
> *S: Not to touch dead animals because they can have germs on them you know.*

In the first part of Li's answer, she relates learning to TO DO THAT in terms of something one ought not to do, but in the second part her answer focuses on the relation between not TO DO THAT and her knowledge about germs. An answer like this will be categorized in both appropriate categories.

Learning in terms of getting TO KNOW is not a very frequent category and will be resumed at the end of this chapter. The next conception of learning is even less frequent than the one described above.

9.3 Learning as becoming (more) able TO UNDERSTAND

Conceptions of learning in this category are related to the *process of comprehension*. Learning can be described here in terms of intellectual skills, a process in the mind in which the child plays an active role himself. The child is aware of his thoughts to the extent that he is able to relate understanding to learning. Learning is thus a process *within the child*. The only examples found were those already used on p. 89.

> *Jenny 8:2*
> *E: If a little child comes to you and asks what's meant by learning, what would you say?*
> *S: You practice and practice and in the end maybe you understand something and then you've learnt.*

Katarina 8:3
E: If a little child comes to you and asks what's meant by learning, what would you say?
S: You learn to understand like, that you understood things and then you know those things like.

To relate learning to becoming (more) able to UNDERSTAND is a very advanced conception which is not very common among adults either, as shown in studies by Säljö (1982) and Dahlgren & Pramling (1981).

Having described the meaning of the conceptions, we will now look at the age trend found in relation to children's conceptions of the "what" aspect of learning.

9.4 Age trend

We will now examine how frequent the previously described categories of conceptions were among children in the main interview study. We will begin with the three principal conceptions of the "what" aspect of learning. Let us look at table 4.

Table 4. Children's conceptions of the "what" aspect of learning[11]

Learning as becoming (more) able			Age			
	3	4	5	6	7	8
TO DO	31	92	100	100	100	100
TO KNOW		4	11	15	11	28
TO UNDERSTAND						8

Conceptions of the "what" aspect of learning are here made from spontaneous responses to the notion of learning only. This is, in other words, what children spontaneously express or label as learning. We can see how every child from the age of five has a conception of learning in terms of TO DO. From the age of four, almost every child has a conception of learning, while less than a third of the three year olds have any idea of learning. If we look at learning in terms of TO KNOW we see how very infrequent this conception is during all pre-school years, while a dramatic increase occurs after one year in primary school. Nevertheless, this conception exists in only one third of the oldest children! The frequency of the idea of learning in terms of TO UNDERSTAND speaks for itself, it is only to be found among primary school children, and very rarely.

Table 5 illustrate the most frequent conception held by these children about learning, namely learning TO DO which can be divided into the subcategories: learning HOW TO DO and learning TO DO THAT.

Table 5. Children's conceptions of learning TO DO

			Age			
Learning	3	4	5	6	7	8
HOW TO DO	31	82	93	100	100	100
TO DO THAT		36	36	52	54	72

We can see in table 5 that the conception of learning in terms of HOW TO DO is the most common way of perceiving learning in these age groups, but it is also worth noting the fairly stable conception of learning as TO DO THAT. It seems that with increasing age the child becomes more aware of this aspect of learning in the pre-school milieu. This is a conception of learning more typical of Swedish compared to Indian children in the pre-school milieu (Pramling, 1981).

The most frequent conception of learning HOW TO DO, was found to be divided into three subcategories; CANNOT to CAN, CAN BETTER and CAN to CAN OTHERWISE.

Table 6. Children's conceptions of learning HOW TO DO

			Age			
How to do	3	4	5	6	7	8
CANNOT to CAN	31	89	100	100	100	100
CAN to CAN BETTER			15	44	65	76
CAN to CAN OTHERWISE			4	19	25	12

In table 6 we can see that some children at the age of five begin to realize that learning is more than an increase in HOW TO DO, it is something which is changeable. There is a gradual increase in children's conceptions of BECOMING BETTER ABLE TO with age, to include around 75% of all eight year olds. The qualitative change CAN to CAN OTHERWISE is a far more advanced conception which is easy to see in the table above. What is confusing here is the decrease in this conception for the older children, something which will be discussed in connection with table 7 below.

Another possible explanation is that the seven year old child takes a dramatic step in his life on entering primary school. This directs a lot of interest and attention into learning from the milieu, and, for the child, entering primary school and meeting real learning focuses his attention on differences in learning in primary school and pre-school. For an eight year old, on the other hand, the primary school situation is taken for granted more since he is used to learning in this context. From what the child perceives from school it seems that in primary school, the focus is on BECOMING MORE ABLE.

The most advanced conception of HOW TO DO was found to be a transition of CAN to CAN OTHERWISE in terms of SOMETHING ELSE or IN ANOTHER WAY.

Table 7. Children's conceptions of learning in terms of CAN OTHERWISE

Can			Age			
otherwise	3	4	5	6	7	8
SOMETHING ELSE			4	19	18	4
IN ANOTHER WAY					11	8

We can see in table 7 that children's conceptions of a transition of learning in terms of CAN OTHERWISE, either SOMETHING ELSE or the same thing IN ANOTHER WAY is not very frequent. What six and seven year olds have in mind is to a large extent reading and writing. These children have a conception of being able to read or write themselves, but they also seem to know that there are more letters or more difficult counting excercises (see e.g. Linda 6:5, p. 97) which will be learnt on entering primary school. On the other hand, the eight year olds' attention is on BECOMING MORE ABLE since they are already able to read and count. The content of what the child perceives as learning could explain why the age trend decreases in the group of eight year olds. (And, it should be added, the difference is far from being dramatic in terms of statistics, it may very well represent random variations between the two age groups.) On the whole, however, the age trend in relation to children's conceptions is fairly stable as seen in the above tables. We could say that what we see here is what children *spontaneously choose to talk about as learning.*

These central notions in relation to learning, namely, TO BE ABLE TO, TO KNOW and TO UNDERSTAND, have been utilized in questions with children for various reasons (for a detailed description, see appendix 3, 4 and 5). We wished *to find out if children had the concepts, even though they did not connect them with learning*. And one could clearly see how children had the idea of TO BE ABLE TO before they connected TO BE ABLE TO to learning. Children also had the idea of TO KNOW at an earlier age than they related TO KNOW to learning, and the relation was similar to the notion of TO UNDERSTANDING, i.e. children had the idea of TO UNDERSTAND before they connected it with learning.

The most advanced conception of learning as TO UNDERSTAND was found to a very limited extent, as seen above (table 4). Learning in terms of TO UNDERSTAND was seen as a product of the child's thinking process. This has also been examined via explicit questions about thinking (for a detailed description, see appendix 6), and with similar results to the other notions. Thus, the child has a capacity to think in terms of CHANGED THINKING before he is able to relate thinking to learning, or before he prefers to use this capacity spontaneously.

The second aim in examining these notions held by the children was to see whether *children could differentiate between them*. One could say the lower the age, the greater the confusion between these notions, and subsequently, with increasing age, the more differentiation between the notions and the greater the similarity with adults' use of these notions.

The third aim in asking questions about TO BE ABLE TO, TO KNOW and TO UNDERSTAND was *to get a wider and more solid base upon which to elaborate questions of the "how" aspect of learning.* These notions have been the starting point for discussing with children their understanding "how to learn". (For instance, an answer to a question "Tell me something you know" was followed up by the question "How come you know that"?)

Let us now go further and see how children perceived the "how" aspect of learning.

10 THE CHILDREN'S IDEA OF THE "HOW" OF LEARNING

In this chapter we will focus on children's understanding of the other aspect of learning, namely "how" to learn. More specifically this means the way children perceive learning in relation to the different "whats" described in the last chapter. We will explore *how the children conceptualize the way in which learning comes about.*

All categorization of the "how" aspect of learning has been made from a particular "what" aspect. This means that after the child has talked about what he has learnt, is learning, or is going to learn, there has been a follow-up question on "how" he learnt, is learning, or is going to learn that special "what". Questions dealing with "how" to learn are e.g.

How did you learn that?
How would you go about learning that?
How would you be able to do that?
How would you go about finding out that?
Is there some way to get to know that?
("That" always referring to the "what" talked about.)

These are the kind of general follow-up questions consistently used, and which constitute the basis for categorization of the "how" of learning.

To obtain a fuller description of how the child perceives learning, the interviewer also suggested examples about which the child could make statements. These will be described in relation to the relevant categories.

As previously indicated, there is a group of questions dealing with the concepts of TO BE ABLE, TO KNOW and TO UNDERSTAND (see appendix 3, 4 and 5) which have constituted a basis for illustration of how to learn. More specifically this means that if a child gives a suggestion in relation to the question "Tell me something you can do (you know, you understand)" his answers is taken as basis for a "how" question: "How did you learn that".

There is one more group of questions suggested by the interviewer: the group used when the child did not volunteer enough examples to discuss further. These were questions many children focused on spontaneously, e.g. riding a bike, swimming, running faster, playing an instrument etc. Thus, in the following presentation, the structure of the relation between the "what" aspect of learning and the "how" aspect of learning will be clarified.

In figure 3, a preview of the second part of the main qualitative results is given. We show here the structure of the system of categories found which revealed the child's understanding of the "how" aspect of learning. Figure 2.(on p. 93), and this figure together summarize the categories used to describe children's varying conceptions of learning.

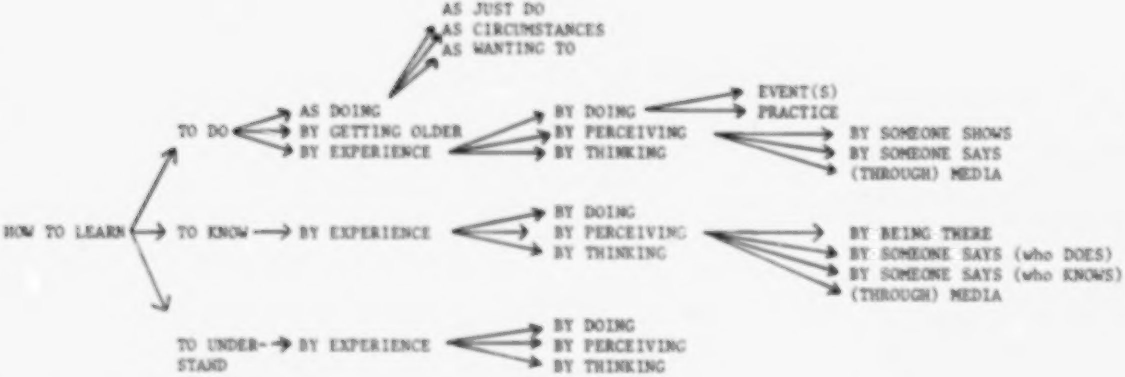
HOW TO LEARN
TO DO
AS DOING
BY GETTING OLDER
BY EXPERIENCE
AS JUST DO
AS CIRCUMSTANCES
AS WANTING TO
BY DOING
BY PERCEIVING
BY THINKING
EVENT(S)
PRACTICE
BY SOMEONE SHOWS
BY SOMEONE SAYS
(THROUGH) MEDIA
TO KNOW
BY EXPERIENCE
BY DOING
BY PERCEIVING
BY THINKING
BY BEING THERE
BY SOMEONE SAYS (who DOES)
BY SOMEONE SAYS (who KNOWS)
(THROUGH) MEDIA
TO UNDER-STAND
BY EXPERIENCE
BY DOING
BY PERCEIVING
BY THINKING

Figure 3. The structure of system of categories depicting the children's conceptions of the "how" aspect of learning.

Let us now look briefly at the main categories of description in which children's ideas of "how" they learn could be characterized. We found the main ways in which children think about how learning takes place. At the most elementary level, there is no distinction made between learning and DOING. At the next level, learning is perceived as a consequence of GETTING OLDER; and finally, learning is seen as a consequence of EXPERIENCE, which is a genuine conception of learning in an adult sense. Learning by EXPERIENCE is then characterized in three main categories of conceptions: BY DOING, BY PERCEIVING and BY THINKING.

The two lowest levels of learning (learning equal to DOING and by GETTING OLDER) are only to be found in relation to learning TO DO, and for this reason conceptions will be developed in relation to this category. By simplifying the main structure of the system of categories presented in figure 2 and 3, we arrive at the picture of the relation between the "what" and "how" aspects of learning shown in figure 4. (The "how" aspect is characterized in terms of the subcategories of the conception BY EXPERIENCE.)

LEARNING

WHAT	HOW
TO DO	BY DOING
TO KNOW	BY PERCEIVING
TO UNDERSTAND	BY THINKING

Figure 4. The simplified relation between the "what" and "how" aspects of learning.

Theoretically, all these combinations are possible (i.e. any of the "what" categories can be combined with any of the "how" categories) and to some extent they are also to be found in the empirical material). But there is some trend towards a certain correlation i.e. learning TO DO takes place primarly by DOING, learning TO KNOW takes place primarly by perceiving. Logically, learning to UNDERSTAND comes about in the first hand by THINKING. However, because of the thin data base in this respect this relation could not be demonstrated empirically.

10.1 How to learn TO DO

It is interesting to note here that ideas about the lowest level of conception about learning, where learning is equal to DOING, were discovered in the observation studies in which some children made no distinction between the situation involved in and the learning. Let us now examine these lowest levels of children's conception of how to learn TO DO.

10.1.1 Learning as DOING

Conceptions of learning in terms of learning as DOING reflect a level where *there is no real conception of learning.* In this category, the child makes no distinction between learning and doing. This lowest level of the categories of how to learn is very tentative, since we have a very small data base for analysis. This conception occurs among the youngest children involved in the investigation. Thus, the reason for the small number of answers and the fairly restricted statements is due to the fact that we use the interview method here at an age level at which children still find difficulty in expressing themselves. However, with this in mind, let us look at the three levels of conceptions distinguishable within the category where learning is equal to DOING [12].

When we talk about TO DO in this chapter, we use it in the sense of HOW TO DO since this is the most interesting aspect. Children's ideas about "how to learn TO DO THAT" are presented in detail in appendix 9.

10.1.1.1 Learning as JUST DO

In this category, children say that they JUST DO without any further reference. Some children also deny any kind of learning; they JUST DO what they talk about.

> *Anna 4:3*
> *E: How do you get the swing to move faster?*
> *S: You just sit down and swing.*
>
> *Maria 5:0*
> *E: What did you do when you learnt to ride a bike?*
> *S: I didn't learn*
>
> *Daniel 3:6*
> *E: What do you do if you want to learn to read?*
> *S: You have to turn the pages.*
>
> *Fia 4:2*
> *E: But what do you do when you learn to read?*
> *S: Just try to read.*

10.1.1.2 Learning as CIRCUMSTANCES

This category represents the second step within children's conception of learning as equal to DOING. But it refers to the child's *distinguishing between doing and not doing in terms of the conditions*. Whether or not one does something is entirely a function of variation in CIRCUMSTANCES: Thus, when circumstances or the equipment change, the world of the child will also change: he will do new things when the CIRCUMSTANCES are different.

> *Emli 3:3*
> *S: Would you like to learn to swim?*
> *E: Yes, what should I do in that case?*
> *S: You have to have swimsuit on.*
> *E: Can I swim after that?*
> *S: Yes.*

Björn 4:6
E: How do you go about becoming a policeman?
S: I put a police cap on and sit in a police car and put on police shoes.
E: Are you a policeman then?
S: Hm.

We can here see how children refer to the CIRCUMSTANCES of their DOING. Thus, Emli (3:3) tells the interviewer to use a swim suit to be able to swim and Björn (4:6) becomes a policeman by dressing up like one. CIRCUMSTANCES provide the conditions for DOING something[13].

10.1.1.3 Learning as WANTING TO

We see here a progression in children's conceptions which in some sense seems to be their first step to awareness of their own involvement in learning. But it is important to stress that the child does not yet have a real conception of learning. The child still perceives that he does or does not do something, but he distinguishes between doing and some conditions related to doing. The child refers to his own WILL, which means that if he wants to do something, he can do it. Thus, in these conceptions, WANT and BE ABLE TO are not separate. In our adult understanding the necessary conditions for doing something related to learning are of two kinds, BE ABLE TO and WANT TO. The child at this level, however, has not differentiated his WILL from BEING ABLE TO. Children say that they do not WANT TO when they are not ABLE TO do something.

Johan 3:9
E: But how do you know when you can take the support wheel away then (from the bicycle)?
S: Just if I don't want it on, then I can.

Niklas 2:11
E: Why do the other children know the whole song and not you .. can you learn the whole song?
S: No
E: Why not?
S: I don't want to.

Christine 3:4
E: Can you learn to ride one (a bike) like Richard's?
S: No, I don't want to.
E: When do you want to?
S: No I don't know.

According to what we have seen it seems that we have reached the baseline of the awareness of learning. The child cannot answer a "what" question on learning for these conceptions since as yet he has no idea of it. It seems as if *the first progress in the awareness of learning is the separation between "want" and "can".*

When a child is able to separate TO DO and what is behind the DOING, there must be an awareness of his own involvement, and an initial idea of learning emerges. Vice versa, it can be that if the child has no idea how to learn, he will say that he does not want to do that, since there seems to be a confusion of these notions.

In these three categories we have seen a slight progression towards the awareness of learning, but for the reason previously stated, these categories are very tentative. Let us now describe the next main category and level of awareness.

10.1.2 Learning by GETTING OLDER

At the next level in children's conceptions of learning the aspects of CAN and WANT are distinguished. The child has grasped the fact that there are skills and activities that he CAN do, but does not WANT TO, and vice versa, i.e. the child wants to be able to do something, but cannot. Learning is seen as a process of maturation occurring as the child gets older. The child can do nothing but wait until he *reaches the correct age* for that particular skill. There seems to be no conflict for the child between WANT and CAN; he has been socialized by adults into the belief that life is a process of maturation where one does certain things at a certain age level, i.e. when one is mature enough, one is able TO DO different things.

> *Karin 4:7*
> *E: How come you can do a lot of things a baby can't?*
> *S: I'm bigger than them and so I can do better things.*
>
> *Emma 3:4*
> *E: How will you go about learning to read those (books) yourself?*
> *S: When I am big.*
>
> *Maria 3:10*
> *E: But how will you go about learning to count up to as much as you can?*
> *S: When I am 13.*
>
> *Catrin 3:3*
> *E: How will you go about learning that?*
> *S: When I am 5 I'll be able to.*

What all conceptions in this category have in common is the waiting until a particular age TO BE ABLE TO DO something. One can of course not exclude the fact that the concept of learning is implied in these children's idea of learning by GETTING OLDER.

There is, however, another group of answers in which the child refers to growth in terms of age, but this conception implies that the child "may not learn" a particular skill before a certain age. These answers have not been categorized here. An example of this kind of conception is the one expressed by Martin:

> *Martin 8:1*
> *E: How will you go about learning to drive a car?*
> *S: I will have to wait till I am 18 and can go to driving school.*

10.1.3 Learning by EXPERIENCE

Conceptions of this level express learning as a consequence of different kinds of EXPERIENCES. This means the child *relates learning to situations* instead of to age as in the previous category. If the child expresses how learning takes place in terms of EXPERIENCE, it is always possible to categorize this further into one of the sub-categories. For this reason, there will be no examples under this heading. But let us stress that when children have grasped that learning takes place by EXPERIENCE *the idea of learning is born.*

The experiences children refer to can be of three different kinds, BY DOING, BY PERCEIVING and BY THINKING. We will begin with the first.

10.1.3.1 Learning TO DO by DOING

Learning TO DO comes about by being *involved in and participating in an activity or situation oneself.* Thus, the child perceives it as if he has TO DO something in order to learn it. To be involved in an experience in terms of DOING can be seen in two different ways. One can say that at the lowest level in this category, learning takes place either by being involved in an experience just once, or many times, but the child has no active role in the learning himself. On the other hand, at the next level of conceptions in this category, the child's own actively-directed role as a learner is explicit.

Some of the answers were impossible to interpret for differentiation into subcategories. These have been categorized on this level only. An example could be:

> *Caroline 5:10*
> *E: How have you learnt that? (to count)*
> *S: I have a board at home and there are rings and I count on them.*

Since most conceptions categorized can also be grouped in one of the two following subcategories, a more detailed illustration with examples will be made later.

10.1.3.1.1 Learning TO DO through EVENT(S)

Learning is perceived as an EVENT which happens suddenly when the child does the activity. The EVENT can be one or several occasions, but the child plays a *passive role* himself. This does not mean that the child as such is passive but his own initiative in learning is not apparent. The learning is *a consequence of being involved in doing, and nothing else.*

> *Victoria 7:1*
> *S: At the very beginning I had a very small bike with a support wheel and then I got a new one like I have now .. at the start I had to have a helmet on in case I fell and hit my head and daddy was with me and helped me.*
> *E: How did you know you could do it?*
> *S: I could .. just suddenly.*

> *Pontus 7:3*
> *E: How did you go about learning to ride a bike?*
> *S: It was my big brother who taught me .. he held the carrier at the back and then I biked.*

It is possible that this conception expresses a lack of seeing different instances or situations as parts of one sequence: a continuing learning process.

10.1.3.1.2 Learning TO DO through PRACTICE

Conceptions of "how" to learn by PRACTISING is the first level in which the child plays an *active role* himself. The child is able to do something by learning himself. The child knows that he cannot become ABLE TO DO without deliberate training or PRACTICE.

For this conception to be categorized here, it is not sufficient for the child to say: "One has to practise". The criterion is either to elaborate and explain what the PRACTICE referred to means, or to give examples which show that the child has really understood his active role in learning. The child has understood how he can decide what to learn and influence that learning actively over a period of time. Consequently, the *child is now able to integrate instances or situations happening on different occasions which have relevance for the improvement of DOING.*

> *Linda 7:5*
> *E: If you want to learn something you don't know, what do you do?*
> *S: You practise.*
> *E: How do you go about practising?*
> *S: Well first, if you want to, for example, learn to walk on*
> *a tight-rope, you maybe have it very low and then higher*
> *and higher each day in .. and then finally you can do it.*
>
> *Christian 7:1*
> *E: But he wants to learn to run even faster. How does he go*
> *about that?*
> *S: He'll have to practise.*
> *E: How do you practise?*
> *S: You have to go out running almost every day. Then you get*
> *faster and faster.*
>
> *Marie 7:1*
> *E: How do you go about learning something by heart? (telephone-*
> *number)*
> *S: He said (bigger brother) 5 and then I said it after him and*
> *then 1 and 5 again and then 4 and then the number was*
> *complete.*
> *E: You said it after him. Did you know it then?*
> *S: I had to say it a few times and then I knew.*
>
> *Mattias 6:4*
> *S: You can play it more times if you forget it.*
> *E: If you want to be very, very good at playing, what do you do?*
> *S: Practise.*
> *E: How do you go about practising?*
> *S: Play it over and over..*

One can here see e.g., in what Mattias (6:4) says, that the idea of continuity is implied by the idea of practising (compare p. 97).

We think that the difference found within the category "learning TO DO by DOING", between those who have grasped the notion of PRACTICE and those who have not, represents a fundamental step in the development of the consciousness of learning. This issue will be dealt with in the concluding discussion.

10.1.3.2 Learning TO DO by PERCEIVING

The child realizes that we can acquire skills or learn to do something by PERCEIVING. Learning takes place when one receives some kind of information via the senses. Learning in terms of PERCEIVING is often related to some situation which can vary between SOMEONE SHOWS, SOMEONE SAYS or through MEDIA (books or television). Learning TO DO by PERCEIVING is always possible to categorize in one of the three sub-categories above and hence the examples will be described in relation to these categories.

10.1.3.2.1 PERCEIVING by SOMEONE SHOWS

Learning TO DO something by looking at someone who demonstrates it, is to learn by perceiving reality as represented by someone. This means that learning is an *imitation* of what one sees or hears.

> *Maria 5:9*
> *S: I saw when mummy dialled it.*
> *E: But do you know all the numbers just because you've seen someone dial them?*
> *S: I don't know, but they dialled a lot, just one day I knew.*
>
> *Pernilla 6:6*
> *S: Make food.*
> *E: How will you learn to do that?*
> *S: By looking at how mummy does it.*
>
> *Erica 6:9*
> *S: If you look on a lot of times, maybe you remember .. if you are good at remembering.*
>
> *Annica 7:4*
> *E: How will she go about teaching you (to bake)?*
> *S: She'll bake and I'll look on, then I'll be able to myself.*
>
> *Lotta 4:0*
> *E: How will you go about it (to teach someone to draw men)?*
> *S: Then I'll have to go to their house and then draw a man myself and they'll look at it when they're going to draw.*
>
> *Helena 6:6*
> *E: Tell me what you did when you learned to play the piano?*
> *S: There are colours and the colours I have in the book, I've got there (on the keys). If I press and look very carefully at which numbers you have to press.*

There is a difference related to the dimension of time involved in learning. Thus, children express learning as a consequence of *imitations of one occasion* (see, for example, Annica 7:4, Lotta 4:0) or the *imitation of several occasions* (see, for example Erica 6:9 Maria 5:9) which can be seen as a practice.

Although this difference is to some extent a function of the child's awareness at different levels, we have chosen to place them in one category where the main criterion is *imitating* something seen or heard. Someone says or shows the skill or activity which the child is able to imitate or *repeat*.

The child's idea of teaching

In the above category of learning the child implies that there is *someone who teaches him*. This level of teaching seems to be preceded by a conception which arises spontaneously in some children, and which can be considered as the most elementary way of thinking about teaching, a kind of base-line of educational thought. Let us look at two examples, first of how a child teaches another child drawing, and secondly, of when a child describes how to teach someone else. During the interview with Kristine (5:0) the following occurred:

S: Mummy can paint the heart.
E: Can you paint the heart?
S: No, you'll see (starts to draw) oh, now I could do it (very happy). This is how I drew before (draws a crooked heart).
E: Now that you can draw the heart, can you teach someone else?
S: No, I can't.
E: Can you try to teach Jonas (a child sitting opposite) to draw the heart?

Kristine responds by drawing a heart on her own paper and in a demonstrative way says "you draw like this and this". Then she takes Jonas's hand and puts the pencil in it,keeping her own hand on his, and tries to draw a heart on his paper and says:

S: Now I've taught you three, so just do it.

And here is a short excerpt from another interview:

Stefan 6:10
E: How would you go about teaching a little child to nail a boat together?
S: Hold his hand when he nails.

From this brief view it seems as if children perceive teaching as getting someone to do something tangible. The learner is made to do what he is supposed to learn, by force, as it were. It is also very common among younger children that their response to questions about learning is to demonstrate what they have learnt. Some children demonstrate what they have learnt TO DO, instead of verbalizing it, and others demonstrate at the same time as they talk about it.

10.1.3.2.2 PERCEIVING by SOMEONE SAYS

These conceptions are related to some kind of explanation which has learning HOW TO DO as a consequence. The difference from the previous category is that reality is represented here by someone who tells or explains. As at the previous level,the "teacher" can explain once or several times before learning occurs. However, these levels will not be distinguished here.

Anne-Charlotte 7:0
E: How do you go about learning to do difficult sums?
S: I think you listen to how others do, and then try and remember and then try.

Pontus 7:3
E: How did you go about learning the time?
S: You looked at a clock and then they told you what time it was, like.

Richard 6:5
S: You shouldn't change gears (on the bike) when you pedal?
E: How have you learnt then?
S: Mummy and daddy said so because you damage the gears.

Karin 5:9
E: How do you go about learning to swim?
S: They tell you.
E: Do you know how to do it, when they've told you?
S: Yes,and then you try like they told you.

Learning is no longer an imitation but knowledge of how TO DO when someone has told you. Thus, at this level, there is a demand for conscious thinking and not only memorizing as in the previous category.

10.1.3.2.3 PERCEIVING through MEDIA
Here the child says he is able to learn TO DO from media, either to *imitate TO DO what has been shown in the MEDIA*, e.g. to draw pictures, write letters etc, or *to excercise a skill (TO DO) acquired via the media*, e.g. to read, tell the time, enact a play etc. A child can also suggest the acquisition of knowledge from MEDIA (see p. 123).

Malin 4:11
E: Can you learn anything from looking at TV?
S: Yes, I've learnt to brush my teeth. They showed you what to do.

Anna 4:7
E: If you read a book, can you learn anything?
S: Yes, to read.

Marcus 5:7
E: How do you know what to do?(build space rockets with LEGO)
S: The instructions show you.
E: Can you build by yourself?
S: Yes, I just look at the pictures.

Joakim 4:8
E: Have you learnt anything by looking at TV?
S: To eat with a knife and fork.
E: Have you learnt that from TV?
S: Hm.
E: How did you go about learning to eat with a knife and fork from TV?
S: I saw how they ate, of course.

You could say that conceptions here have features of both the previous categories. The child may mention learning from TV or books by imitating an activity or learning from someone who explains how TO DO. Children usually say they learn to read from the book or from texts or words on TV. Very few children give spontaneous answers about learning how TO DO by mentioning either of these MEDIA but answers arise when the interviewer asks if the child is able to learn anything from reading books or watching TV. Children can thus suggest what they learn from MEDIA to a greater extent when the idea of this learning is implied by the question: e.g. Can you learn anything by watching the TV?; then they suggest learning from MEDIA spontaneously.

Learning TO DO can occur in different ways: the last category to be developed is when learning TO DO is seen as a consequence of THINKING.

10.1.3.3 Learning TO DO by THINKING

TO DO is seen here as a *consequence of thinking*. This is a conception which is rarely shown spontaneously. Conceptions characterized as learning by thinking reflect the active involvement of the child's own thinking process. The child is able to use his own thoughts in an active way to learn. Learning TO DO by thinking is to a large extent related to *remembering*: the child perceives that he is ABLE TO DO by memorizing, but refers to his own thinking. Some examples of the above follow:

> *Fredrik 6:4*
> *E: Do you know your own telephone number by heart?*
> *S: I haven't learnt it yet.*
> *E: If you want to learn, how would you go about it?*
> *S: It would be a bit difficult .. I'd have a piece of paper.*
> *E: But if you want to learn so you remembered without the paper, what would you do then?*
> *S: I'd try to do like .. you'd have a piece of paper first .. then I'd put it aside. Hide it so I didn't know where I'd put it. Then I'll keep it in my head and not play wild games so I forget it.*
> *E: Do you forget when you play wild games?*
> *S: Yes .. I do anyway.*
>
> *David 5:4*
> *E: But how come you didn't know later on (what you should do)?*
> *S: I just looked and thought .. but then I remembered.*
>
> *Richard 6:5*
> *E: But how do you know how you'll nail it together to get a car?*
> *S: You have to think out how you'll nail and so ..*

Richard (6:5) offers the only example of thinking, in the sense of FINDING OUT how TO DO spontaneously. Every other conception here is related to remembering.

Since FINDING OUT by THINKING is an idea which seldom arises spontaneously, a direct question has been asked separately (for detailed description, see appendix 7). Thus, the "how" aspect of learning FINDING OUT by THINKING has been fixed (i.e. implied by the question) and the child suggests *what* he has found out. In relation to this question, it was far more common for children to give examples of what they had discovered TO DO by THINKING than TO KNOW or TO UNDERSTAND. This will be returned to.

Spontaneous suggestion of learning TO DO by THINKING appears to a large extent in answers to a particular question about what it takes to learn a phone number (see appendix 8).

10.1.4 Age trend

Let us now examine to what extent these categories of description were to be found among the children in the main interview study. Starting with the main categories in table 8, we see results of two different kinds: frequencies increasing with age and frequencies showing a non-linear age trend (frequencies increase to a point then decrease again).

Table 8. The child's conception of "how" to learn TO DO.

	Age					
	3	4	5	6	7	8
Learning as DOING	46	50	11	4		
Learning by GETTING OLDER	23	32	30	11	4	4
Learning by EXPERIENCE	15	64	100	100	100	100

We see here how learning seen as DOING dominates the younger children's conceptions. The conception of learning by GETTING OLDER increases during the lowest age levels to decrease subsequently after the age of five. The idea of learning by EXPERIENCE is definitely acquired by the age of five and occurs to a large extent among the four year olds.

In the next table we will examine learning as DOING in three subcategories; DOING as JUST DO, CIRCUMSTANCES and WANTING.

Table 9. Learning TO DO as DOING.

	Age					
	3	4	5	6	7	8
JUST DO	28	24	11	4		
CIRCUMSTANCES	15	7				
WANTING	15	21				

As we can see in table 9, JUST DO is the most common conception when learning is synonymous with DOING. These answers were often very short. To find conceptions which referred either to CIRCUMSTANCES or WANTING demanded a more elaborated answer.

Table 10. Learning TO DO by EXPERIENCE.

	Age					
	3	4	5	6	7	8
by DOING		57	100	100	100	100
by PERCEIVING	15	50	85	96	100	100
by THINKING			4	19	7	40

As it is obvious from table 10, learning TO DO by DOING is the most common conception, but learning TO DO by PERCEIVING is also a conception held by half the group as early as at the age of four. Learning TO DO is not very often seen as coming about by THINKING, but we can see that eight year olds make a dramatic step in this regard. Most of the conceptions thus categorized derive from a particular question about how to learn a new telephone number (see appendix 8). Learning a phone number was seen by the younger children as taking place by imitation, while older children referred to practice or thinking repeatedly.

ing TO DO by EXPERIENCE was to be found in two subcategories; learning TO DO by EVENT(S) or by PRACTICE.

Table 11. Learning TO DO by EXPERIENCE.

	Age					
	3	4	5	6	7	8
by EVENT(S)		43	96	81	93	84
by PRACTICE		4	33	67	89	96

When considering the two subcategories into which the conception learning TO DO by DOING was differentiated in table 11 we find a clear age trend when the idea of PRACTICE is considered.

With increasing age the child becomes gradually more aware of his own active involvement in learning. Comparing the two alternative conceptions one could say that an event is something which happens to you, while PRACTICE represents something done actively. If the child does not express the conception of learning TO DO by PRACTICE it probably does not exist for him, since it has been tested in relation to many different skills or activities mentioned either by the child or the interviewer. A frequent follow-up question was: What would you do to be better, swim or run faster,etc? The child has many opportunities to indicate the idea of learning TO DO by PRACTICE if he has this in his mind.

Table 12. The child's conception of TO DO by PERCEIVING.

	Age					
	3	4	5	6	7	8
by SOMEONE SHOWS	7	39	78	93	89	72
by SOMEONE SAYS		4	7	7	11	32
THROUGH MEDIA		39	59	74	79	92

We can see in table 12 that learning by PERCEIVING is a fairly early developed conception of learning TO DO. Imitation is seen as the most obvious way of learning up to the age of six, then the frequency of this conception decreases again.

Learning by SOMEONE WHO SAYS is found only occasionally below the highest age level. In relation to learning TO DO from books or TV, we see an increasing awareness with age about one aspect of the book or TV, namely to learn TO DO something from MEDIA. From the content of what children say, we note a change from imitation towards imagination, e.g. from learning to write an A, towards learning to read.

Let us sum up this presentation of the results of learning TO DO by stressing how important the conception of learning by DOING is. This is also reflected in the number of categories into which this conception is differentiated.

10.2 How to learn TO KNOW

Children's understanding of how to learn TO KNOW something can be described in the same main categories as the "how" aspect of learning TO DO (see, p. 106, figure 3).

Since the lowest level of conception of HOW TO LEARN (learning as DOING) is logically possible, but does not exist in the empirical data, it will not be elaborated here. On the next level, there is the conception of "learning TO KNOW by GETTING OLDER" which exists empirically to a very limited extent and for this reason we will only give an idea of how it can be reflected in the child's thinking.

The conception how to learn TO KNOW as learning TO KNOW by GETTING OLDER refers to the child suggesting that he will know *as time goes by and he becomes older*, or when he refers to parents knowing because they are older. There is no understanding of their own active role in learning to know, it is just a passive view, according to which knowledge comes with age.

> *Fredrik 7:0*
> *S: I didn't understand that there were Optimists* (a sailing boat) *when I was little.*
> *E: What do you understand now then?*
> *S: That there are .. I have one.*
> *E: Is there anything else you understand?*
> *S: Yes, many such things.*
> *E: How come you understand many things now .. that you didn't understand when you were little?*
> *S: Because I'm big.*

Fredrik (7:0) is asked a question about TO UNDERSTAND but answers in terms of TO KNOW. He knows by now that a kind of sailing boat exists which he did not know about when he was younger.

The conception of getting TO KNOW by GETTING OLDER is an obscure conception which occurs very rarely. For this reason, one can generally say when a child talks about learning TO KNOW, it is done in terms of learning by EXPERIENCE.

Since learning is to a great extent not perceived spontaneously in terms of learning TO KNOW, the interviewer suggested questions to find out a more differentiated picture of how to learn TO KNOW. There were many different questions in the pilot studies like:

> How would you go about finding out how a radio works?
> How would you go about finding out how the telephone works?
> How would you go about finding out why a boat can float in spite of it being so heavy?
> How would you go about finding out what kind of food you have to buy for your new aquarium fish, etc.

It is interesting to observe here that children very obviously *related knowledge to a particular person.* Knowledge about the radio, telephone, boats food etc was related to people dealing with these areas. A child would ask a captain about boats, etc[14].

There were also other ways for children to conceptualize how they would go about finding out TO KNOW. The main structure, learning TO KNOW by DOING, by PERCEIVING and by THINKING will be developed. But since the HOW category, learning by PERCEIVING is the one most closely related (both logically and empirically) to the WHAT category; learning TO KNOW, we can reasonably expect a greater differentiation there. (Just as was the case with the HOW category, learning BY DOING, in relation to the WHAT category, learning TO DO.

Various questions (see above) form the basis for this categorization as well as examples suggested by the children of something they know or want to know (see, appendix 4). For the most part we chose one particular question which we found most revealing in the pilot studies to illustrate the following categories. This question was: What would you do if you wanted to find out how far away the moon is? (later labelled as "the moon question").

In addition to the questions listed above, there was another question used for categorization. In this case the direction was reversed, the "what" aspect of learning not being used as a starting point. Instead the interviewer suggested a "how" aspect of learning (learning from TV or books) and if the child could give a reasonable example of *what* they could learn in that way, it was concluded that he had an understanding of the fact that one can learn from media.

10.2.1 Learning TO KNOW by DOING

Conceptions of HOW TO LEARN TO KNOW in this category are expressed by the child in terms of involvement and by *doing it yourself*. By practising something yourself you get knowledge. In other words, you discover knowledge by DOING.

With regard to "the moon question" conceptions are categorized here when the child says he has to go to the moon or suggests some kind of measurement of his own, a concrete action by him. The child has to do something himself TO KNOW the distance to the moon.

> *Jenny 6:9*
> *E: Then he* (a little boy named Orvar)*would like to know how far it is to the moon. Can he find out in some way?*
> *S: Yes in a space rocket.*
> *E: Must he go there to find out? Can't you find out in another way?*
> *S: No.*
>
> *Daniel 8:8*
> *E. How can you know how many ice-creams you can get for your money?*
> *S: Just since you must have bought it before - eh .. that's why you know.*
>
> *Caroline 5:6*
> *E: What would you like most of all to know?*
> *S: How many flowers there are in the whole world.*
> *E: How can you find that out?*
> *S: Travel to all the countries and count all the flowers.*

10.2.2 Learning TO KNOW by PERCEIVING

Conceptions of learning to acquire knowledge by PERCEIVING can be observed when children express their understanding of how to learn TO KNOW. Thus, this category will be the one most differentiated into sub-categories. Moreover, if a conception is characterized as learning TO KNOW by PERCEIVING, it is always possible to describe it in one of the following subcategories by BEING THERE, by SOMEONE SAYS (DOES), by SOMEONE SAYS (KNOWS) or through MEDIA.

10.2.2.1 PERCEIVING by BEING THERE

Conceptions of how to know by BEING THERE refer to the child's talking about his own exposure to a situation or setting. This means that the child has to be involved in a situation which creates knowledge. Although he is a *passive onlooker* he will acquire the knowledge. Reality is represented here in the world of the child as he perceives it.

With regard to "the moon question" no conceptions were found which could be characterized here, hence the examples are answers to other questions.

> *Christian 7:1 (a long dialogue about how planes function)*
> *E: How do you know?*
> *S: I know because I've seen it .. flew in a plane once.*
>
> *Fredrik 6:4*
> *E: Aha .. why do you think that theirs becomes another colour?*
> *S: I don't know.*
> *E: Can you find out in some way? How is it that theirs is a different colour from youre?*
> *S: I'll try maybe to do it.*
> *E: How would you go about finding out?*
> *S: I'll look very carefully one time at what they have in it.*
>
> *Marcus 5:7*
> *E: Can you tell me something you've learnt?*
> *S: I've learnt that in Switzerland the trains were grey .. some of the carriages were so long that you saw the tail and the driver's cabin when it turned a corner.*
> *E: How come you've learnt that trains are grey in Switzerland?*
> *S: I've seen it.*

10.2.2.2 PERCEIVING by SOMEONE SAYS, WHO "DOES"

Conceptions of acquiring knowledge in this category mean that the child is able to *acquire knowledge from someone* who tells him. This someone is, however, a particular person *who has experienced a situation* or been involved in an action or setting. In a sense one could say that this is a kind of *expertise conception*, where the best answers are found through people who are involved in a particular domain. Knowledge is here *personified* by people who illustrate in practice. With regard to "the moon question" the child says he has to ask an atronaut, someone who has been to the moon, or who works at a satellite base.

Christian 7:1
E: If he wants to know how far it is, how will he find this out?
S: He can ask .. someone who travels in a space rocket.
E: But do you think this boy Orvar can find it out some other way?
S: He can ask the astronaut.

Michael 7:0
E: Have you any idea how you could find out about it?
S: I would ask someone who worked with it.

Linda 6:5
E: What do you do if you want to find out about something?
S: You ask someone who knows.
E: Who can you ask how far it is to the moon?
S: If I find an astronaut.

Jenny 6:7 (a discussion about how the radio works)
E: If mummy and daddy don't know, how can you find out?
S: You can ask the people who work on the radio.

10.2.2.3 PERCEIVING by SOMEONE SAYS, WHO "KNOWS"

Conceptions of learning TO KNOW by PERCEIVING now begin to reflect the idea of general knowledge. Grown-ups know a lot and if you want to find out something you can ask someone who knows. *Knowledge begins to be universal* but this knowledge is still connected with a human being. The oral way of transmitting knowledge is most important for the child, so that someone who has knowledge is able to transfer this by telling about it.

With regard to the moon question, the child says he can ask his teacher, parents etc.

Susanna 5:10
E: How would you go about getting to know it?
S: I'd ask mummy or daddy and if they didn't know I'd think of something else.
E: Wouldn't you care about finding out?
S: No, I'd have to wait till they knew it.

Marie 7:7
E: If you want to know how music comes from a radio, what would you do to find out?
S: I'd ask daddy.
E: Do you think he knows?
S: Yes.

Jenny 6:7
E: If you want to know how far it is from here to the moon what would you do to find out?
S: I don't know.
E: What do you usually do if you want to know something?
S: Ask mummy and daddy.
E: Do you think they know how far it is to the moon?
S: I don't know.
E: What do you do if mummy and daddy can't tell you. How can you find out?
S: I don't know ... look at a map.

10.2.2.4 PERCEIVING through MEDIA

In this category knowledge has become *impersonal*. The source of knowledge here is *information* from a medium (a book or TV). Knowledge can be transferred without a person; it is something in itself.

With regard to "the moon question" the child will suggest that the distance to the moon can be found out by reading a book or watching TV.

> *Li 5:9*
> *E: How have you learnt?*
> *S: From TV.*
> *E: What kind of programme was it?*
> *S: That a bird lay dead in oil.*
>
> *Eva 6:6*
> *E: Have you learnt anything from looking at TV?*
> *S: Yes, if you know a recipe when you make food.*
> *E: Can you make what you have written down?*
> *S: Yes, we even learned how to make ice-cream.*
>
> *Johan 7:4*
> *S: Ask others if they know, or look at books. Perhaps it is in pictures.*
> *E: What can you get to know from reading books?*
> *S: You can learn to read .. and learn as much as you want and if you don't know you can do it if you have read a lot in books .. you get clever then.*
> *E: How are you when you are clever?*
> *S: You know a lot.*

In one sense children seem here to possess a more universal conception of learning, but this is not complete. Although children have given expression to the conceptions categorized here, these conceptions are very narrow. We must stress the relation to the content talked about. Thus, children very often refer to a particular programme in which the interviewer's question was illustrated, or to a particular book in which this information has been read. The child says e.g. "We have a book about that here in the pre-school" or "I saw a programme the other day about that".

Even if children understand how to acquire knowledge via media, this does not mean that they understand that there is a large body of existing knowledge. We will return to this question in discussing the age trend.

10.2.3 Learning TO KNOW by THINKING

This conception means that the child is able to express that *his knowledge exists as a result of his own thinking.* In all conceptions, it is an expression of something the child *has found out* or is going to *find out* by THINKING.

> *Lennart 7:3*
> *E: Can you tell me something you've learnt in the group?*
> *S: Yes we play and then we read .. once someone had to lie under a blanket and then you had to count to 10 before wondering who sat there, but I can reckon it out because first I think of who's sitting here and then I know that he's away (a game in which a child hides under a blanket and another child must guess who it is).*

With regard to "the moon question" it is logically possible for a child to say that he would find out the answer by using mathematics if there were known variables like time and speed. Naturally, no child mentions this, but one child makes an attempt to find a way of arriving at the answer by THINKING.

> *Andrea 6:11*
> *E: Can't you guess how you'd go about finding how far it is to the moon?*
> *S: I would've thought would shut my eyes since I usually think better then. How far it can be?*
> *E: Can you guess it then?*
> *S: Wonder. Think like 1 2 3 4 5 6 7 8 But it is so difficult I think. Don't really know.*
> *E: But do you think you can discover how far it is to the moon just now?*
> *S: No.*
> *E: If you want to know something, what do you do?*
> *S: Then I usually ... if you see the moon, eh, then you can count you see the moon. Yes that's silly. It is not so easy to count then. How would you do it? It is quite a long way away, isn't it .. then you can count it out. It usually works. Sometimes I count how long years .. you know when lightning strikes then you should count. But if it takes too long, you come up to 100 and then I think it is difficult to keep going..*

Andrea denies the possibility of finding out by THINKING but, at the same time, she tries to suggest some kind of mathematical approach by referring to the possibility of knowing how far away a thunderstorm is by counting the time lapse between lightning and thunder.

10.2.4 Age trend

We will begin to examine the differences between age groups by looking at the frequency of conceptions of how to learn TO KNOW among children at these age levels in relation to the main categories in table 13.

Table 13. The child's conception of "how" to learn TO KNOW.

	Age					
	3	4	5	6	7	8
by DOING		25	44	67	57	52
by PERCEIVING		11	44	74	82	100
by THINKING					7	12

We can here see that the conception learning TO KNOW by DOING is most frequent by the age of six, decreases gradually later. On the other hand, learning TO KNOW by PERCEIVING gradually increases in occurrence over all age levels. Almost half the five year olds possess this idea and practically all eight year olds are aware of the fact that one can learn TO KNOW by PERCEIVING. To learn TO KNOW by THINKING is a conception only occasionally shown by these children.

As indicated in appendix 7, a question has been directed to the child about FINDING OUT by THINKING and in relation to this question some more children suggested to find out TO KNOW. Most answers were, however, of the character OF REMEMBERING knowledge already acquired, but later forgotten.

Table 14. The child's conception of learning TO KNOW by PERCEIVING.

			Age			
	3	4	5	6	7	8
by BEING THERE			11	22	21	24
by SOMEONE SAYS WHO (DOES)			7	33	50	60
by SOMEONE SAYS WHO (KNOWS)		4	33	52	68	76
by MEDIA (books or TV)		11	15	33	39	76

As is apparent from table 14, approximately one fourth of the six, seven and eight-year-old children have grasped that by BEING THERE in a concrete situation, one can acquire knowledge. The child not only knows that he has BEEN THERE but also what this BEING THERE leads to in terms of knowledge. There is a gradual increase with age of the frequency of conceptions by learning TO KNOW from SOMEONE WHO "DOES" something as well as by SOMEONE WHO "KNOWS". The child's answers indicate that he mentions more often that he asks parents and other people around him than "experts", while it is a very usual conception for the oldest children to ask where knowledge comes from. Acquiring knowledge from books or TV is mentioned for the most part in children's responses to that particular question. Thus the child has grasped, for example, that there is a message in a book. The dramatic increase in children's awareness of learning about the content of a book or TV programme comes after one year of schooling.

On the whole, however, we could summarize this section on children's conceptions of HOW to learn TO KNOW by saying that at the age levels investigated, knowledge is very much personified. Previously, knowledge was acquired from wise old people, while today's children see themselves turning more to "experts".

10.3 How to learn TO UNDERSTAND

Logically the two lowest levels of HOW TO LEARN, (learning as DOING and learning by GETTING OLDER), previously described, may also be thought of in relation to learning TO UNDERSTAND. However, as there are only a few conceptions of TO UNDERSTAND through GETTING OLDER in the empirical data, we will not elaborate this further but proceed to the categories found with regard to learning TO UNDERSTAND by EXPERIENCE. As previously, here again there are three sub-categories; learning by DOING, by PERCEIVING and by THINKING.

10.3.1 Learning TO UNDERSTAND by DOING

The category of learning TO UNDERSTAND by DOING is a logically possible category but does not arise in the empirical material. The conception which should have been basis for this category would be understanding as a result of a concrete action. But since there are no examples let us proceed to the next categorization.

10.3.2 Learning TO UNDERSTAND by PERCEIVING

The same criteria apply as in the other categorizations of to UNDERSTAND Understanding depends on the information coming via the senses, either from a person or a medium of some kind; the most common way of learning TO UNDERSTAND.

> *Erica 6:9*
> *E: How did you understand that?*
> *S: When mummy told me .. or I don't remember who told me.*
>
> *Charlotte 6:8*
> *E: Do you think you understand what you've been told?*
> *S: Yes I think so, but it's not always sure.*
> *E: Why isn't it always sure you understand?*
> *S: Well, because maybe you don't understand no matter how they've explained "what do you mean really" you ask I don't understand.*
>
> *Mette 6:6*
> *E: How come you understand it then?*
> *S: Well, we get food, otherwise we can't live and if those (potatoes) don't get water other potatoes can't grow.*
> *E: How do you know that?*
> *S: Mummy said so.*

10.3.3 Learning TO UNDERSTAND by THINKING

TO UNDERSTAND by THINKING means that the child creates the understanding himself. The child *learns by invention*, where the awareness of thinking plays an important role. Understanding is produced by the child's own thinking process. Though logically the **HOW category** of LEARNING by THINKING is the one which is most closely related to the WHAT category of LEARNING TO UNDERSTAND but, since this is a very advanced level of thinking about learning,practically none of the children mention instances of this conception spontaneously.

> *Anna 6:8*
> *E: Do you always understand what's in the book?*
> *S: No.*
> *E: What should you do if you don't understand?*
> *S: You can ask your mummy or daddy but if you're grown-up then you have to think it out for yourself.*
>
> *Mette 6:6*
> *E: Didn't you understand that from the beginning? (about a newly erected fence around a house)*
> *S: No.*
> *E: But when you thought about it what did you decide?*
> *S: It was probably because a girl called Sophie her little brother usually crawls underneath and now he can't.*

Katarina 8:3
S: Yes I understand that's it is silly to fight.
E: How come you understand that?
S: Well, if someone hits me I think it's not nice and if I hit someone else, he'd also think it wasn't nice either.

Anna (6:8) who suggests learning TO UNDERSTAND by getting information from parents, fits into the previous category, but she is also aware of the fact that one can UNDERSTAND by THINKING since she suggests this is the case for grown-ups. Mette (6:6) talks about a fence whose erection in a particular place she could not understand. After thinking she realized that it had been put there to prevent an accident happening to a little child. Katarina (8:3) demonstrates the capacity of taking another person's perspective by thinking, and as a consequence this changed thinking made her understand something.

Very few children brought up learning in terms of understanding spontaneously. Most of the answers categorized here as conceptions of the "how" aspect of learning were given in relation to questions in which the interviewer herself suggested the phenomenon of understanding (e.g. Tell me something you have understood? How did you do that?) (cf appendix 5).

10.3.4 Age trend

As we can see from table 15, these notions occur very occasionally. The very few children who have any idea about how to learn TO UNDERSTAND most commonly refer to someone who has told or explained something.

Table 15. How to learn to UNDERSTAND.

	Age					
	3	4	5	6	7	8
by DOING						
by PERCEIVING				7	11	12
by THINKING				4	4	4

As can be seen in appendix 7, we have also explored children's understanding of the fact that they can find out things by thinking. (In a similar way as we have investigated their understanding of the concepts of BEING ABLE TO (appendix 3), TO KNOW (appendix 4), TO UNDERSTAND (appendix 5) and TO THINK (appendix 6)). From the answers to the question "Have you ever found out something by thinking about it?" we can conclude that 7, 4 and 16 % among the 6, 7 and 8 year-olds-realize that one can understand something through thinking. Among the 8-year-olds there were thus four times as many children who had the idea than in the case when they had spontaneously to bring up understanding by thinking as an example of learning.

11 THE MAIN FINDINGS OF THE INTERVIEW STUDIES

The empirical data which consists mainly of interviews with young children constitutes a rich material for analysis. This has made it difficult not to digress into the various children's conceptions of interest. However, we will now try to summarize the most important findings.

The overall conception of learning or framework within which children's conception of learning can be described is that learning means TO BECOME (MORE) ABLE by EXPERIENCE. Thus, learning is seen as a change from one state to another. Before describing specifically the qualitatively different conceptions found within this framework, let us look at the conditions necessary to be able to grasp the child's way of thinking.

During the pilot studies it became clear that it was impossible to work with the notion of learning as a whole. There had to be a distinction between the two aspects of learning; *the "what" of learning and the "how" of learning*. These different aspects of learning must be separated in order to delve into the world of the child and acquire an understanding of learning from his point of view. Thus, one of these components has to be taken for granted or "fixed" while the other component is taken up with the child. In other words, when interviewing children these two aspects have to be dealt with separately. On the other hand, in analysing the interviews,both aspects of learning have to be considered.

The two aspects of learning, "what" and "how" depend on each other. There has to be an ongoing combination of these two aspects. The way to analyse, interpret and describe the child's conception of *how* he learns always depends on *what* the child says he has learnt. This relation works both ways: it is, in other words, not only "how" to learn which depends on "what" to learn, but the "what" aspect also depends on the "how" aspect when the latter is "fixed" (as occurs in some questions).

11.1 Awareness of what to learn

Within the what aspect of learning three qualitatively differing conceptions of learning were found. They were labelled learning TO DO, TO KNOW and TO UNDERSTAND. These conceptions represent a progression from learning manual skills, i.e. TO DO something practical towards learning TO KNOW about the world around, and finally as learning TO UNDERSTAND something. The totally dominant view of learning among the 3 to 8-year-old children was learning in terms of TO DO. The child's world is a world of actions and this is seen in their way of thinking. As soon as a child is able to express what he has learnt, he does this in terms of TO DO. Learning in terms of TO KNOW is encountered only occasionally prior to one year of schooling, where at least one out of four children spontaneously express learning as learning TO KNOW. Learning in terms of TO UNDERSTAND is only met in the oldest children, and only to a very limited extent (8 %). Learning in terms of TO DO was seen as a distinction between NOT BEING ABLE, and BECOMING ABLE. This distinction represents *a transition from one state to the other*, which, for young children, is a sudden change. When the child begins to be aware of the *gradual change*, an important step has been taken in his way of thinking. The child becomes aware of an improvement in his skills which can be qualitative or quantitative. The improvement can be described as a process progressing from BEING ABLE to BECOME MORE ABLE. About 40 % of six-year-olds express conceptions of improvement and the frequency increases up to 75 % among the 8-year-old children. Underlying this conception, there is the idea of *continuity*, which is of great importance for the understanding of learning. Moreover, it is worth noting the conceptualization of learning as a change from CAN to CAN OTHERWISE either as SOMETHING ELSE or as IN ANOTHER WAY. The most advanced conception of learning HOW TO DO is learning TO DO the same thing in another way. This category was found to be applicable to the answers of 11 and 8 % of the seven and eight-year-olds respectively.

As stated above, the child's discovery of a continuity aspect is of great importance in relation to learning. Continuity here implies two aspects: continuity in terms of preserved identity and continuity in terms of gradual improvement.

To be able to see learning as a continuing process, the child has to see similarities between different occasions:

> *The confusion of the four-year-old about continuity of relations is seen when he asks such questions as 'Were you always my mother?' It is difficult for him to comprehend that a relation that exists here and now also existed in the past and will endure in the future.*
> *(Stevenson, 1972, p. 87)*

Thus, the child must be able to identify different occasions as parts in a series of learning events related to the learning of the very same capability or skill before he can see learning in terms of gradual improvement. When the child is able to *identify different occasions extending over a period of time as being components of the same phenomenon* (to learn something), he can probably also see continuity in terms of gradual improvement.

Stevenson (ibid) maintains that as long as the child has not grasped this continuity in terms of identification, it is also difficult for him to discover a relation in learning where things learnt in one situation can be applied in another. To discover continuity is not only of great importance for what the child perceives as learning, but also for his understanding of how learning takes place (see, also p. 130).

11.2 Awareness of how to learn

The child's conception of the "how" aspect of learning has been examined in relation to the three main ways of concerning of its "what" aspect. There are different ideas about how to learn TO DO, how to learn TO KNOW and how to learn TO UNDERSTAND. As far as the first one is concerned there were three main categories found. For many of the youngest children there was no developed conception of learning. At the first level children used learning as equal TO DO; without making a distinction between the two concepts. This way of thinking about learning has three different forms, where the first is JUST DO with no further reference. At the next level, the child refers to CIRCUMSTANCES, i.e. to equipment or visible attributes, which determine whether one DOES or DOES NOT DO something. At the third level, the child refers to WANTING. Though realizing that the difference between to do is related to his person in some way, he cannot distinguish between WANT TO and BE ABLE TO. Consequently, as he expresses it, whether or not he does something depends only if he wants to or not.

When the child is capable of distinguishing between WANT TO and BE ABLE TO, the next level of conception of learning is reached. Here learning is seen as a consequence of GETTING OLDER. Time in relation to the child's own age determines his becoming able TO DO something.

The final step is learning BY EXPERIENCE, which means that learning takes place when one is involved. Here *the idea of learning is born.* The three main conceptions of how learning takes place described above show very obvious age trends. The lowest level of conception, namely, learning as equal to DOING, is mainly seen among the three and four-year-olds. Becoming able as a consequence of GETTING OLDER is mainly seen in the three four and five-year-olds, and the frequency of this conception decreases later. The idea of learning BY EXPERIENCE can be found in more than half of the four-year-olds, while every child from the age of five has this notion. In other words, one could say that by the age of five the idea of learning, in a form which is structurally similar to adult thinking, exists in every child's consciousness.

This, more "mature" conception of how to learn is unfolded into three different forms; learning BY EXPERIENCE may refer to learning BY DOING, BY PERCEIVING or BY THINKING. In principle any of the three main ways of conceptualizing the "what" aspect of learning can be combined with any of the three main forms of learning BY EXPERIENCE. In the present chapter we restrict us, however, to only dealing with the most frequent or most interesting combinations, namely learning TO DO BY DOING, learning TO KNOW BY PERCEIVING and learning TO UNDERSTAND BY THINKING.

One interesting finding was the difference within the category of learning HOW TO DO by DOING used to designate the most frequent conception of LEARNING BY EXPERIENCE. This difference concerns whether one thinks that a skill is acquired through EVENT(S) or through PRACTICE.

EVENT(S) is the predominant idea during all pre-school years. This conception represents learning as a consequence of as happening when DOING an activity or skill. Learning suddenly takes place after a shorter or longer period of DOING. In contrast to the child's passive role here, we can see PRACTICE as an active indicator of the child's own learning at the next level of conception. Here the DOING has to be consciously exercised as a basis for learning to take place. The dramatic awareness of the child's own role in learning a skill, comes around the age of six, and extends to all children at the age of eight. When a child becomes aware of his own active role in learning, an important step is taken.

When the child has grasped learning TO DO as something that takes place by PRACTICE, continuity in terms of gradual improvement is understood. Thus, to understand "what" to learn as a continuous process the child must see continuity in terms of identity, while to understand "how" to learn the child must grasp continuity in terms of gradual improvement. By looking at the age trends in the "what" and "how" aspects of continuity in relation to learning we can see a similar increasing trend. There is a sharp rise in the frequency of conceptions implying continuity by the age of six followed by a gradual increment during the following two years.

In learning TO KNOW by PERCEIVING one interesting finding is that children relate learning TO KNOW to a person, from the age of five, where TO KNOW begins to exist in their way of thinking up to the oldest children. To find out everyday knowledge or questions which the child raises himself, the child commonly sees that he can ask his parents or other people around, while for more specific tasks or questions he turns to experts or people who are involved directly in the desired area of knowledge. *Knowledge is to a large extent personified.* When children's understanding of the concept TO KNOW was examined (see appendix 4) it was obvious that children to a large extent thought about knowledge in terms of knowing about themselves or another person who did something.

Knowledge about something interpreted in a more general sense was encountered in approximately half of the children from the age of six and on. We could not find a clear age trend here since these conceptions reflect what the child chooses to say. There is a deficiency in the empirical data, since no question was used to test *competence* in relation to the understanding of the concept of TO KNOW. When the interviewer asked the child "Tell me something you know!" and he answered, for instance, "I know that my mummy's name is Svea", no further prompts were used to explore whether or not the child was capable of using TO KNOW in a more general sense.

Thus, the quantitative aspect of the child's conception of learning TO KNOW must be seen as a measure of what the child happens to say and not what he is able to say. It is clear, however, that children to a greater extent define knowledge, as well as relate the acquisition of knowledge, to human beings.

Another conception of to learn TO KNOW by PERCEIVING is learning TO KNOW through MEDIA (books or TV programmes). This is not a very frequent conception until the age of eight, although it can be observed to a very limited extent as early as the age of four and its occurence gradually increases each year. Learning TO DO through MEDIA is a far more frequent conception.

11.3 Awareness of one's own thinking and understanding

Freudenthal (1978) caught the moment when his grandson Sebastian, at the age of 4 years and 2 months, became aware of how he could find out by thinking:

> *Bastiaan who selectively collects what he finds on the street, picked up a piece of a wire fence, as it were a flat spiral of wire. Then he pulled out a thick rubber ring from his trousers-pocket and made a move on the wire while kept horizontal, as a 'walking-path' then he inclined the wire and finally kept it vertical so that the ring danced downwards along the wire. Then while we walked further, he took out a little piece of plastic from his pocket and made it fall along the wire, which was an even funnier spectacle. Next he took out of his pocket a flat aluminium beer-bottle top: 'Now I must do something with this' I suggested to him that he should make a hole in it at home: this made a mighty imimpression upon him and caused a vivid technical discussion. Suddenly he said something like 'a screw-nut has a hole where the screw fits in', dipped his hand, with an expert gesture, into his pocket, fetched a screw-nut from it (he had got two of them) and carried out the same experiment, an extremely funny spectacle. I said to him 'You are a great inventor; what haven't you invented?' though I doubted*

> *whether he understood the word 'inventing', but after a while he himself said: 'I thought out a thing.' Proudly he demonstrated his invention at home.*
> *(p. 195)*

The way in which Freudenthal caught the child's sudden awareness was impossible to repeat in the interview situation. In this study, awareness was explored from direct questions.

Altogether, 53 children out of 149 had some idea about what they could find out by thinking, but the oldest children are over-represented here.

With regard to the conception of "how" to learn TO UNDERSTAND, the category of learning TO UNDERSTAND by THINKING is the most interesting. This is only occasionally a spontaneous conception, but when this way of learning is suggested by the interviewer (in the form of "finding out by thinking") far more children show a grasp of the idea. We find this sporadically, as early as 5 years of age, while occurence of this insight is more systematic in the six-year-olds and the older children.

Though it is most common that children suggest finding out that or HOW TO DO something, 16% of the eight-year-olds expressed that one can understand things by thinking. According to the results shown in appendix 7, there is also a small group of children of six, seven and eight years of age who are aware of the differences between their thinking now and when they were younger.

When this was tested out by a direct question about thinking now and then or thinking in another way, there was a response first among the three oldest age groups of children: one fourth of the five and six year olds knew that they think now, something they were not capable of as younger children. Roughly, one third of the older children were aware of thinking more or in a different way now. One fifth of the five and six-year-olds and some over one third of the eight-year-olds were aware of a change in their thinking, either in terms of thinking about SOMETHING ELSE than previously, or thinking IN ANOTHER way about the same phenomenon.

In the research tradition which constitutes the intellectual context of this thesis, learning is seen in terms of changed conception or changed meaning of the phenomenon learnt about. This is, however, not a very common perspective on learning not even among adult students in their professional training (Dahlgren & Pramling, 1981). With this as background, it is interesting to note that some pre-school children already have the ability to grasp a change, and also *grasp a qualitative change in their own way of thinking*. Thus, the conditions for seeing learning in terms of a changed meaning are established in early years, in some cases, at least.

Awareness about one's own memory plays another important role in the awareness of learning. Very young children can sing songs and tell nursery rhymes but they think they have learnt them just by hearing them, and perhaps they have. But what these children are not able to do is to decide consciously to learn a new song or nursery rhyme, since they do not know how to use their memory. A small group of six and seven-year-olds and 40% of eight-year-olds have a conception of using their thinking for learning, in this case a telephone number. The awareness of their own memory made these children believe that they were able to memorize a new telephone number after a short period of time, and separated them from others who said they needed a longer period of time during which they could learn it as a function of their being involved in situations in which they had to make a phone call.

This reflects the difference described above between learning through EVENT(S) and learning through PRACTICE, i.e. the difference between exercising a skill on purpose and learning it due to the fact that one *happens* to be involved in its execution.

When a child has grasped how to utilise his memory, the idea of practice in terms of thinking emerges. There is a relation between the awareness of improvement in an activity and the child's own conscious repetition. Thus, to learn a phone number as in this study, the child must not only be aware of the fact that he thinks, but also how he can actively memorize by repetition.

Memory was also found as an aspect of discovering by thinking. The child is able to find out things by thinking, which were learnt and then forgotten. This can also be seen as an aspect of the child's awareness of his own thinking process.

A young child lives to a large extent in the "here and now". However, to become aware of the idea of repetition or PRACTICE, the child has to transfer himself from the "here and now" and see things which occur at different times in relation to each other. According to Lundberg (1981), being able to transfer from the "here and now" is one necessary condition for being able to read. Learning must be seen in a more general, abstract way, to understand the relation between occasions separate in time, which is a condition for the conscious use of repetition or exercise.

Kail (1979) summarizes one aspect of metamnemonic skill, as memory-monitoring, by saying:

> *By age 6 children can determine if information is well stored in memory, but they will become more expert at this three or four years later. However, realising that a fact is not learned well does not automatically lead a 6-year old to study further but does lead 8-year olds to do so. (p. 59-60).*

According to the results of this study, we can see how children during these two years make a dramatic increase in their understanding of their own involvement in the process of learning. They also become aware of how to become (more) able by PRACTICE or repetition.

If we look more generally at children's awareness of learning, we could say that there is a *variation between the child's preference and the child's competence;* in other words, what the child prefers to talk about or what he is aware of. Thus, although the child does not perceive learning in terms of TO KNOW, with increasing age he becomes aware of the possibility of acquiring knowledge from books or TV. Hence, children have conceptions which they do not express spontaneously.

We have also seen how the conceptions of "what" to learn, namely TO BE ABLE, TO KNOW and TO UNDERSTAND are *continuously differentiated* with increasing age (see appendix 3, 4 and 5). This continuing differentiation means that at the early ages, the conception of TO DO dominates. TO KNOW as well as TO UNDERSTAND is interpreted in terms of TO DO. With increasing age, both concepts (TO KNOW and TO UNDERSTAND) are interpreted in terms of TO KNOW. The differentiation of TO KNOW and TO UNDERSTAND is only at its starting point in the oldest age groups. Thus, in relation to TO UNDERSTAND, the perspective of TO KNOW is dominant, and a relatively small but gradual increase towards differentiation of TO UNDERSTAND is seen. Approximately one fourth of eight-year-olds are able to differentiate TO UNDERSTAND from TO KNOW. The most obvious differentiation was thus made between TO DO and TO KNOW at the age levels investigated.

We can conclude this chapter by saying that many children as young as six and occasionally earlier are aware of their own active role in learning and also of their own thinking. However, they do not relate their own thinking to learning or their active role to thinking even though the conceptual prerequisites for doing so seem to exist.

PART III. DISCUSSION

12 SUMMARY

This part of the thesis relates our findings to the theoretical and contextual frame chosen. We will also briefly discuss the methodological aspect and suggest how these findings could be used in everyday work with children at pre-school.

12.1 Methodological discussion

From a methodological point of view there are a few implications which require to be indicated. First, what kind of information has this investigation given and how can we look at the reliability and validity of what we have noted about children's conceptions of learning via interviews. We wish to assert that this focusing on a particular phenomenon in the child's world of thoughts is of relevance for research as well as for practical work with children in the context of pre-school.

In the interview situation the main idea was to enter into a *developing interaction* with the child, i.e. the interviewer had to motivate and stimulate the child to explore his thoughts to the greatest extent possible. For many of these children the interview situation is probably their first reflection about the phenomenon of learning. Children learn many things constantly and this learning is more or less taken for granted. They now suddenly faced a situation in which they had to think about and verbalize this "taken for granted".

We have seen that there is a hierarchical structure of qualitatively different conceptions. In one respect one could say that these conceptions are additive. Older children give expression to a larger variety; they have access to a wider repertoire. In another respect, one could say that access to the whole means more than the mere sum of individual conceptions. To have a more differentiated repertoire means a greater flexibility with regard to content.

One complex aspect of this study is the *variation in competence and preference*, i.e. what the child is able to say and what the child prefers to say (Flavell, 1977). Questions of preference are, for example, what the child says he learns. Questions of competence concern, for instance, if the child has learnt anything from books or TV, if the child is able to find out anything by thinking etc. Thus all categories are not comparable in equal terms, but it is none the less interesting to look at them in relation to each other. We note how far more predominant the aspect of TO DO is in all categories where the child is able to choose himself, while other aspects emerge when the child's competence is tested. One question where this distinction is fairly clear is in comparing learning in terms of TO KNOW with learning from books. It is at least twice as usual in all ages for children to perceive that they acquire knowledge from books as it is for them to relate knowledge to learning. This means, that *conceptions of children are dependent on the question being asked*, since different questions with different contents and notions related to different contexts reflect different possibilities for the child to understand. A consequence of the variation of questions between competence and preference is that in tables where competence is tested we obtain an obvious age-trend, while this is not always the case in questions where the child is allowed to choose the dimension in which to answer.

Children's competence and preference are largely integrated, although they appear differently in relation to different questions. One can of course never be sure if it is preference or competence that is reflected in the child's answers. Yet another source of variation has to do with children's reality.

Children have experiences from two different milieu outside of their homes, namely, pre-school and for the oldest age group, primary school. However, it is not only between these two groups of children that a variation in reality exists. Children experience different types of learning tasks during this period, and as a consequence they reflect upon different realities.

In talking about the child's awareness of learning it is important to stress that *it is not the same phenomenon all children are talking about.* Since children have different experiences and awareness, they are from the child's point of view different phenomena. We have seen how a child often has a conception of learning which has been interpreted in terms of different levels of awareness. The purpose has not been to categorize children, but to categorize their conceptions of the phenomenon of learning. Since we have seen that these conceptions can occur together at the same time in relation to the context, it becomes a question of mapping the *repertoire of conceptions of the child.* Thus what we are describing is children's different conceptions of learning as a consequence of their reflections on their situation and experienced reality.

It is also important to stress that although children talk about different realities according to the different learning tasks in focus, the *previous conception does not disappear.* For every new level of conceptions the child will have a wider number of conceptions accessible, but will not relinquish earlier ones. This is comparable to Werner's (1973) view of the development of mental processes, where he maintains that new levels of symbolizations do not entail that earlier ones disappear. One could say that there is a general trend towards more advanced conceptions, but there has to be some reservations, since these earlier conceptions of children are also to be found among adults. Huang (1930) conducted experiments in physical causality with children as well as with their teachers and found comparable conceptions. In this study, many adults thought in very concrete terms like most children do and often had as limited an understanding of phenomena as the child. However, adults could relate and explore their understanding more verbally.

12.1.1 Assessment of reliability and validity

After the categories of children's learning conceptions had been discerned on the basis of the interview studies, a co-judge familiar with the research tradition of the present work, as well as with children's way of thinking, made an analysis of thirty randomly chosen child interviews from the main interview study.

Inter-judge reliability does not say anything about the categorization as such, i.e. about the categories chosen. Reliability is only a measure of the *extent to which another person has the possibility of seeing the same categories* in the interviews as the author does, on the basis of the instructions given (see appendix 1).

Agreement on whether or not a certain category was applicable to an interview protocol was found to vary between 86 and 100 % for the various categories, with a median of 97 % (the same value was also found as the reliability of the categories described in appendix 3, 4, 5, 6 and 7)[15]. Seven of thirty interviews were judged identically by the author and the co-judge. The number of categories found varied between seven and twenty-two in these interview protocols. Another question is that of validity in the sense of whether our attempt to characterize the child's conception of learning in fact reflects this conception of learning.

Taking a child seriously means accepting what the child says as an expression of something. As a concequence, the most direct way of finding out a child's conception about something is to ask him or to confront him with the phenomenon and let him expose his conceptions. The next step is to interpret what the child actually says. This is a responsibility of the researcher which is closely related to knowledge about child development in general. *Interpreting child interviews is a task of looking at interviews in the light of knowledge about children and the more general context they are in.* Of course, there are statements of answers which are impossible to interpret, but this is of no account since the interview as a whole has to be taken into consideration. The great number and large variety of questions that have been used, and the answers which seem to give a reasonably homogeneous picture, can also be seen as supporting the validity of the findings. Last, but not least, the large numbers of children who were chosen from different social areas in the city is another important factor in the generalizability of results.

12.1.2 Generalizability of the results

Which findings of the study can be generalized and how?

There are two kinds of results discussed in this study: qualitative and quantitative. Our main interest concerns the former; the categories of description in terms of which, we believe, the child's conception can be characterized. The question of generalizability in this respect can be formulated: would the categories found in this investigation be applicable to other children of the same age levels or would we find new conceptions, not included here?

The groups of children who have participated in our interview studies are probably not entirely representative for the population of Swedish children at the ages of 3 to 8 years. On the other hand it seems reasonable to expect that the normal variation in thinking has been covered by the selection procedure employed. We would like to argue that the variation in children's conceptions of learning has been revealed (at least as far as the present culture in Sweden is concerned). Of course, we cannot exclude the possibility that some new varieties of conceptions could appear in another investigation, though we think it would still emerge within the main frame-work described here.

The second question regards the generalizability of the quantitative results. Would the conceptions appear with the same frequencies in another investigation? This can only be expected to the extent that the procedure employed and the groups participating were similar to the methods and subjects in the present study. Unfortunately there is little we can say about this issue as it has not been our main focus.

The third issue relating to generalizability, also this of a quantitative nature, concerns the developmental trends accounted for. All the quantitative results originate from the sixth main interview study in which the participating children at different age levels have on average the same socioeconomic background. Thus, even if the frequencies of conceptions are not generalizable in absolute figures, we have reason to believe that this is the case for differences in frequencies between age levels.

12.1.3 Some remarks on the method of child interviews

In evaluating the interview method with young children, the child's imperfection in expressing himself must be emphasized. It is necessary to enter the child's world. We know from Isaac's (1930) studies that children can use more advanced notions in their everyday experience. Thus, by observing children's spontaneous play, for example, the results of a study would look somewhat different.

All who come in touch with young children know that they occasionally raise questions which seem very advanced. Piaget (1973) also gives examples of how children raise advanced "why-questions" but he thinks that the child often wants a narrow and concrete answer. In other words, whatever the answer is, the child will assimilate it into his way of thinking. Even though a child uses a notion or terminology which seems advanced, this does not necessarily show a more advanced way of thinking.

However, even if we accept that the child has access to a more advanced repertoire of notions than an interview can provide, it would be very difficult to observe spontaneous reflections about a particular phenomenon like learning since this is not a phenomenon the child reflects on in everyday life at pre-school. Piaget (1970, p. 291) says:

> *Further, and this is a fundamental point, the most original and the most important part of the answers which the children gave us had never been communicated to anyone before it was given to us. Children do not talk amongst themselves about their conceptions of nature and in so far as they put questions to adults upon the subject, these tend to annul the purely childish character of their conceptions.*

In depending on spontaneous reflections when observing a child, one also has to interpret from the available data. However, by having a dialogue with the child, the interviewer can always go further in interaction to gain a fuller understanding. Finally, teaching is a communication-process where dialogue can be seen as a goal as well as a tool in influencing a child's way of thinking and for this reason the method has to be elaborated further.

In interviews with children the child must be asked suggestive questions while not being allowed an easy way out in giving a quick answer.

> *But it should be added that it took us three years to discover this fact. Formerly, when a child told us that 'the cloud moved along with the wind' we left it at that. (Piaget, 1970, p. 61)*

An answer always has to be followed up by "Why did you say that?" or "How does that happen?" etc. In other words, one tries to get the child to elaborate his thoughts as far as possible. Conducting interviews with young children is a laborious task. As previously indicated one has to try and re-try questions over and over again. One also has to develop a way of talking with children to avoid the "normal" leading style of a teacher. There is, moreover, a need to be sensitive in interpeting what the child is referring to in his world of experience.

12.2 Children's conceptions of learning

In summarizing and discussing the results, we would like to begin by saying that the pre-school child's way of thinking is totally dominated by the notion of action. The child approaches reality as an active human being and this activity in terms of concrete experiences creates the child's way of thinking (Piaget, 1969; Werner, 1973). Learning is most commonly expressed by children as becoming (more) able TO DO something, and the way by which one becomes (more) able is by DOING.

The developmental trend of children's conceptions of learning can be looked at from different perspectives, but let us begin by looking at cognitive development from the particular point of view of the present study.

Flavell (1977) summarizes Luria's theory of the development of verbal self regulation by saying that the first phase of development concerns the origin and nature of the speech which does the regulating. In the beginning, only the speech of others can influence the child's behaviour. There is, in other words, an *external* influence from another person. The child will soon be able to respond to control-oriented communication from others. He acquires some capacity to produce and be governed by his own overt speech. This second step in the developmental process can be called *self-external*. The final development in the process is labelled *self-internal*, which means that the child is now able to control his own behaviour by self-initiated messages.

> *It is the same process as Vygotsky long ago pointed out, cognitive development consists partly of the gradual transfer of control from others to the self; a function that was initially divided between two people eventually comes to reside in one of them, namely the developing individual himself.*
> *(ibid. p. 65)*

We have seen, for example, in the question of learning a phone number, how young children trusted the environment, parents or a note, while the oldest children trusted themselves and their own memory. Another aspect is the differentiation between activities through which learning occurs, seen as EVENTS, or as PRACTICE, where in the first case external circumstances create the learning while self-regulation is the dominant aspect of learning by PRACTICE.

Piaget (Flavell, 1963, Gruber & Vonèche, 1977) also describes the developmental trend of thinking, as a development from *external* towards *internal* (action) within the child, from *concrete* doing towards *abstract* symbolization. He also describes development as a process progressing from seeing things in an *absolute* way toward relativity and from a *perceptual* view toward *logical deduction*, from focusing on *one* variable toward focusing on *many;* and from focusing on *results* toward focusing on *processes.* All these notions of Piaget's reflect an increase in the involvement of the child's own activity, which is a central point in cognitive development in general.

12.2.1 A Piagetian view of children's conceptions of learning

In looking at the results from a Piagetian point of view, we could say that on a general cognitive level children's conceptions become more *decentred.* The child is able to see learning from a broader perspective involving different kinds of learning, and learning as a phenomenon in itself. This increase in abstraction is shown in children's conceptions with increasing age. Using the Piagetian perspective, what is it then more specifically which makes a child aware of his learning?

Although learning is not a physical phenomenon, let us look at Piaget's (1970) description of children's conceptions of physical causality. In experiments on the child's understanding of the nature of air, wind, movement, shadows and the mechanism of bicycles, we will look at children's conceptions at the stages which are relevant to this study.

The origin of *wind* is conceived by young children at the *first* level, as if wind is produced by man or God. At the *second* level, wind is seen as a result of the movement of the bodies which we see as moved by the wind, e.g. clouds, trees, waves, etc. At the *third* level, children refuse to explain how wind is made. They look upon it as making itself from the air, but this process appears to them inexplicable.

At the *first* level movements of clouds are seen as magical. We make clouds move by walking. At the *second* level, clouds move because God or men make them move. At the *third* level, clouds are supposed to move by themselves; and finally clouds are pushed by the wind.

Children conceive of *shadows* at the *first* level as both internal and external to the object. Thus, shadows both emanate from the object and are seen as a result from outside, e.g. night, clouds, etc. At the *second* level, a shadow is seen as produced by the object alone. And finally, at the *third* level, there is a relation between shade and light.

The mechanism of a bike is at the *first* level seen in global terms and entirely randomly. Reasons for a bike working are seen in the lamp, the pedals etc. At the *second* level, pieces of the bike are examined in detail, but isolated from each other. At the *third* level, an explanation or relation between parts is looked for.

The levels described here are not comparable directly with children's conceptions of learning, but we will indicate some points in relation to our results. If we examine the first levels of physical causality, there are indications which resemble the conception of learning as DOING. We have seen when children talk about TO DO how they relate causes to each other at random, and how this finalism makes them think in almost magical terms. We have also seen in the examples above of physical causality as well as in children's conceptions of learning, how things just happen. This is, according to Piaget, the animistic way of thinking, in which no cause need exist since things are able to direct themselves. At this level of thinking there is a lack of interest in how the phenomenon takes place.

> *The mental orientation of the child is directed entirely to immediate relations, conceived without intermediaries, and dwells not for a moment on the 'how' of the process in a question.*
> *(Piaget, 1970, p. 218)*

Another aspect of this conception of learning, concerns the child's inability to distinguish between CANNOT and WANT TO. The child perceives it as if he is able to DO what he wants to, just as things around him are able to do what they want to. A balloon, for instance, flies up in the air because it wants to. Animism and artificialism are closely related to the child's tendency to think in terms of his own will.

Children conceive of e.g. waves on a lake, as due to the will of the water itself. At the same time, waves are seen as due to man, since they are made by man. Physical causality is, at these earliest levels, conceived in terms of psychological causality.

At the next level of understanding learning, children try to look for a connection between factors although these are still vague, as they do when explaining, e.g. the mechanism of a bicycle, or the origin of air or wind. Learning is seen as a consequence of GETTING OLDER or as being involved in an action, but the conception of learning is still as vague as the relation between cause and effect in physical causality.

At the third main level of conceptualizing learning, the subcategory learning by PRACTICE indicates that a relation between an antecedent and its result is found. The child is now able to see himself as the cause of learning.

Animism, artificialism and finalism which dominate the earliest levels of conceptions are now changed into an objective relation between cause and effect. During this period there is a constant progression towards the establishment of a series of intermediaries and of series ordered in time. This is also a prerequisite condition for seeing practice on different occasions as parts of a continuing learning process.

In relation to learning in terms of learning TO KNOW, we have seen how knowledge is related to a large extent to people. We can also see in Piaget's experiments above, how people or God produce e.g. wind and cloud movements. Phenomena are artificially made by someone and consequently this someone also has knowledge about the world.

Piaget (1977) points to the necessity of developing the child's thinking *first in terms of "why" before going further to "how"* in solving different tasks. Thus, the child first has to reflect upon the result, before being able to reflect about the process, "how" something occur. In this study, we could see how the child's awareness of the outcome of learning precedes reflection over how he can DO, KNOW or UNDERSTAND something. This means that the notion of TO BE ABLE is there before the child is capable of relating TO BE ABLE to learning, to how that particular TO BE ABLE comes about. The same phenomenon exists in the notions of TO KNOW and TO UNDERSTAND. Furthermore, according to Piaget (ibid), awareness originates from integration of observations of the results and observations of the child's own action. He becomes aware when he is able to combine and integrate action and result. With regard to how children perceive learning, it seems to follow that in DOING, the acting is observable, and this must be a reason for the first awareness of learning in terms of skills and activities.

Piaget (1978) points to the fact that young children forget the starting point of an action. With regard to learning, before the child is able to see his own active involvement as a necessity, he has to go backwards from the "here and now" situation. This entails a kind of reversibility in the child's thinking. If this is a possible explanation of the child's awareness of learning seen from a Piagetian view, we can notice how reversible thinking in relation to learning begins as early as the age of five, and seems to include all eight-year-olds. This is far earlier than Piaget established the existence of this ability. Vice versa, when a child is able to see a starting point and a result, he is able to think in terms of a process, which is a condition for seeing practice on different occasions as one continuous learning process. Piaget (ibid) points out that when a child is aware of a goal, his actions acquire a general direction. What does the awareness of learning mean then to the child? Probably, the degree of awareness of learning places limits on possibilities of seeing a goal nearer or further away from the "here and now" situation.

We would like to summarize this section by quoting Piaget's research from one of his earliest works where he refers to Andemars and Lafendel who have shown that manual activity is essential to the child's mental development.

> *During the first stage (3-4) the child's thought is 'stemmed by action'. This is the stage of manipulation. During the second (5- 7) 'there is henceforth an alliance between motor and mental activity', action provokes thoughts. During the third stage (after 7 or 8) work becomes orderly, movement is controlled by thought, because thought precedes action.*
> *(Piaget, 1976, p. 383)*

Lastly we wish to mention what Piaget (Piaget, 1970, Gruber & Vonèche, 1977) and many others have pointed out, namely a relation between conceptions of the world around and self-concept. Piaget's theory is based on a gradual differentiation between the internal and the external. The world of the very young child is explained in terms of self, while with increasing age the child is able to distinguish between what comes from himself and what forms part of external, generally observable reality.

To examine and establish a single child's conception, it is of course important to consider the child's concept of himself, since this most probably influences his way of looking at the world. However, since our purpose is not to judge the relevance or otherwise of the child's thinking (whether it is good or bad ,etc) but to describe qualitatively differing conceptions among a group of children at certain age levels nothing would be gained from finding out the individual child's self-concept. Since we aim to describe how children perceive learning, we do not deal with the self-concept in this study.

12.2.2 A Wernerian view of children's conceptions of learning

Heinz Werner's main idea is to view the development of thoughts as a progressive differentiation and systematic integration, proceeding towards more flexibility in thinking. Support for this idea can be clearly seen in children's conceptions of learning. For the youngest children, and for most of the children participating in this study, learning is learning TO DO, as an undifferentiated whole. But we can also see signs of a differentiation towards perceiving learning in terms of learning TO KNOW and learning TO UNDERSTAND. Moreover, with increasing age, there is a greater flexibility in seeing various kinds of learning. Learning also represents a greater symbolization when learning TO KNOW and learning TO UNDERSTAND are developed as conceptions. Although we can see differentiation and hierarchization in relation to the conception of learning, this becomes even more explicit when the child's understanding of the different concepts TO BE ABLE, TO KNOW and TO UNDERSTAND are tested.

From the quantitative analysis of central notions, we could say that the pattern emerging represents a good example of what Werner (see p. 26) labels as the orthogenetic principle: development in the domain of cognition occurs by an increasing differentiation of reality as perceived by the child as well as the integration of these parts in a whole. One could say that the most important differentiation to be seen here takes place between TO DO and TO KNOW. We can also see how differentiation is extended. One example is that though very few children spontaneously relate understanding to thinking, they are able to reflect upon their own thinking.

Werner also talks about the child's world as a world of actions and this view is very much supported by our results. Most obviously, the child relates TO BE ABLE, TO KNOW and TO UNDERSTAND to action. In Werner's terms, the child approaches these notions from the action they represent. *"What will I use knowledge for if not TO DO something!"*

Actions are also frequently mentioned with regard to FINDING OUT BY THINKING. The child uses his thoughts to find out actions. In summarizing these notions, one could say that the conception of TO DO with regard to TO BE ABLE, is crystallized very early. The next step in the hierarchy is the notion of TO KNOW which takes a dramatic step for children at the level of six years of age. Thus, roughly 70 % are able to respond properly to the question of TO KNOW, as distinguished from TO DO. Finally, we wish to point out the limited differentiation of the notion TO UNDERSTAND. The majority of children's conceptions of TO UNDERSTAND are labelled here as TO KNOW. It should be pointed out that the boundaries between these two concepts in everyday language are vague.

In comparing the child's conception of learning and the child's conceptions of TO BE ABLE, TO KNOW and TO UNDERSTAND it can be said that *these three notions are developed earlier than the child relates them to learning.* We can also see how these *notions become differentiated by age.*

Hence Werner's view on development, as an increasing differentiation towards greater formability and symbolization, is highly applicable to the results of this study.

12.2.3 A metacognitive view of children's conceptions of learning

As Markman (1973) indicates, it is clear that a child is better at reflecting and elaborating his thoughts on concrete learning in terms of TO DO, than about symbolic learning in relation to learning TO KNOW and TO UNDERSTAND.

To think about one's own thinking has also been looked at here. Children do not reflect spontaneously about their thinking, but when asked to do so, a significant number could. In the question about learning a phone number, we could clearly see how the oldest children not only knew that one had to utilize the thinking process to learn a phone number, but also used the strategy of repeating the phone number to learn it (Flavell, 1977).

It is not easy to ask children to reflect about their own learning, a process which is taken for granted in everyday life, but they do when asked to. However, their reflections are largely about what they learn TO DO and how they learn BY DOING.

Brown (1978) distinguished between knowledge and understanding of that knowledge. In this study, we have seen how children have knowledge which they can express far earlier than they can understand that this knowledge is a result of learning. On the other hand, the child has reached a metacognitive level when he knows that he knows, and also when he can differentiate between different concepts and reflect about his own action, knowledge or understanding.

Cauley and Murray (1982) stated that children's beliefs about success or failure in school are more related to trying harder than knowing more. It is obviously an important step in a child's life when he realizes his own role in learning; when he understands that he can learn TO DO by PRACTICE. It is of equal importance also when the child realizes his own role with regard to learning TO KNOW and learning TO UNDERSTAND.

Children's conceptions of FINDING OUT by THINKING seem to be a good indicator of their awareness of their own active role in using their minds. And when children realize that they think in a different way now than when they were younger, or when they can relate thinking to their own understanding, they have acquired a valuable skill in metacognitive terms.

Piaget states that during the pre-operational stage the child can think but not think about his own thinking (see p. 20). Many children at this age level, however, could reflect about their own thinking when asked to. According to Piaget, to reflect about one's own thinking is a capacity the child has at the stage of formal operational thinking, but this study has shown that most six and seven year olds, and occasionally younger children, are able to reflect about their own thinking.

12.2.4 A phenomenographic view of children's conceptions of learning

The mapping of children's conceptions of learning as seen here is an example of what Marton (1981) described as an approach to research from a second order perspective: children's conceptions about phenomena are elucidated from an internal perspective. The child's view of learning is described in qualitatively different categories that can help us to understand his way of thinking.

In comparison with other empirical studies carried out in the INOM-group (see, e.g. Säljö, 1982, Lybeck, 1981, Wenestam, 1981, Larsson, 1983) the most obvious difference concerns the "what" and "how" distinction. In earlier studies, the distinction between "what" and "how" has never been made explicit, since the "what" aspect has been more or less given, as the studies concerned the learning or remembering of a text, or learning about a particular phenomenon. (The same distinction has, however, been dealt recently by Johansson, Marton, Svensson (forthcoming), Theman, 1983, Andersson & Lawenius, 1983.)

Since this is not the case in this study, the task becomes far more complicated. The complexity of this study is caused by not fixing the "what" aspect. It varies as a consequence of letting the child choose the phenomenon to be talked about. Moreover, since the presentation of results in this study are based on a close relation between "what" and "how", there is a large variety of conceptions described in categories. Learning means a great number of different things to a child, while the kind of learning previously investigated in our research group has been learning from books, which is not a central dimension of learning for children.

In spite of this, there are some notable similarities, one being Säljö's (1982) differentiation between a taken-for-granted perspective and a thematic view of learning, in terms of which children's learning can be seen as a progression in the direction of thematization with increasing age. The comparison is only on a general level, where thematization means reflection on how learning occurs.

In looking at learning TO KNOW, some further similarities with previous studies may be noted. The difference between the deep and surface approach to learning, found first in investigations concerning how adults learn from texts, can also be seen in the child's conceptions of "what" he learns. From a *situation experienced*, a child can learn TO DO what he experiences; at one level this can be seen as surface learning or reproduction. In a sense learning is the experience. But from an experience a child can also acquire knowledge which entails learning something beyond the experience. In the latter case, the child has made an inference or a conclusion from an experience in a way which is similar to the deep approach described earlier.

In the *teaching situation* depicted in the two studies of themes, we can also observe the difference between the deep and surface approaches to learning. Some children express learning the words the teacher uses only, which can be taken as a reproduction of the teacher's knowledge. However, there were also children who understood what was represented by the words being used, namely the teacher's knowledge about something in reality. A similar difference can also be noted with regard to *reading books or watching TV*.

Children express focusing on the surface level, learning the sign, learning to imitate from media, but there are also some who have conceptions of learning which reflect an understanding of what the sign represents, namely the meaning of the messages.

12.3 How children learn

What meaning does action have for the child's way of thinking? For the child, to learn a skill means to be practically involved in doing something. To learn TO KNOW means to a large extent to find out by DOING, or to find by asking someone who DOES. Moreover, TO KNOW relates primarly to knowledge about something one is able to DO oneself or TO KNOW about other people who DO something. Furthermore, a more general conception of TO KNOW something is often talked of in terms of making something (e.g. paper, bricks etc). TO UNDERSTAND by THINKING means for most children who had the idea of FINDING OUT by THINKING to find out something TO DO . This means that TO KNOW to a large extent is TO KNOW about action.

If we look at the teaching situation in primary school as well as teaching in terms of classroom discussions or working with themes (as we have seen in chapter 6) in pre-school,these activities are primarily carried out from the assumption that knowledge is something in itself, i.e. TO KNOW as distinguished from TO DO.

Thus, if we compare the child's perspective with the school perspective of knowledge, the question to be raised is: *is it possible for a child to grasp the idea of knowledge separated from the action from which it arises or in which it results?*

If we look at the awareness of learning, an awareness of a kind of learning which the child has not experienced cannot exist. Thus, if we compare central notions and how these are related to learning we can see that the notion of TO BE ABLE exists before this is related to learning. Further, we can see how there is awareness of TO KNOW before knowing is related to learning and the same phenomenon exists in relation to understanding. Hence awareness of TO BE ABLE, TO KNOW or TO UNDERSTAND precedes awareness of these notions in relation to learning. In other words, *one idea of knowledge must exist in the child's way of thinking before he is able to grasp the idea of learning TO KNOW as learning.*

From the empirical data, we see that children at these age levels have *a very limited or no awareness of impersonal, generalised knowledge.* This is a statement which cannot be fully proven by the results, since (in table 14) it seems that a relatively large group of children have the idea of acquiring knowledge of the content of a book. However, the children never talked about this as general knowledge. The children gave an *example of something* they had learnt from a book or a TV-programme. They suggested something they could remember, a single experience, or they gave this kind of answer to the "[illegible] moon question". In the latter case, it was clear that most children who answered by referring to books or TV-programmes referred to a *concrete experience* they happened to have had. They said they had books at home or in the pre-school or that they had looked at a TV-programme which they brought up in their answer.

12.3.1. Learning as described in relation to the observational studies

We found in the observation studies the origins of the dichotomy between the "surface" and the "deep" approach to learning. From children's understanding of the learning - teaching situations observed, we noted how children either approached the situation as such, i.e. they were oriented towards the "here and now" or they approached what was dealt with in the situation, i.e. they were oriented towards phenomena generalizable beyond the specific situation. The "surface" approach could also be seen in terms of learning to reproduce or to imitate i.e. TO DO what the children have experienced. The "deep" approach could be seen in terms of learning to acquire knowledge about the world around i.e. TO KNOW or TO UNDERSTAND something.

The dichotomy of a "surface" and a "deep" approach seems to be of a *structural character*. If a specific teaching content is introduced to learners who lack the prerequisites for understanding the aim of that content, they can only deal with that content in a superficial way.

Thus, the different learning situations observed in pre-school are based on the teacher's idea of giving children "some knowledge", an idea which most children in pre-school have still not grasped. The child who is very adaptable tries to make the best out of it by doing what the teacher expects him to do; he tries to memorize in order to answer. Consequently, what compulsory school is criticized for i.e. directing children's learning towards "surface" learning in terms of memorization and rote learning, seems to be a problem introduced as early as in pre-school. It is introduced because there is a gap between the teacher's intentions and the child's way of thinking. The learning situations observed have very little to do with the child's reality. But even if children do not understand the content of the learning situation, they at least understand how to behave in a learning situation i.e. to memorize to satisfy the teacher. Of course teachers do not only want to educate children how to behave, but this seems to follow as long as we create learning situations based on conceptions which children do not possess. If the child lacks the idea of acquiring knowledge about the world around him, the only thing he can do is TO DO what he observes at the "surface", to reproduce passively. In this way children are forced to a "surface" approach to learning which is most probably a necessary but not sufficient condition for success in learning at higher levels.

12.3.2 An integrated perspective on the findings

Children's thinking is examined and described to a large extent by psychologists. Their particular view of children determines how children's thinking is described and analysed. Frequently a psychological perspective means a description phrased in terms of how competent or advanced the child's thinking is. Since this perspective is not fruitful for this study we have to propose an alternative view. As stated in our introduction, we would like to look at conceptions of learning from an *educational perspective*. By an educational perspective we mean that the educational milieu is taken as a point of departure. The pre-school milieu constitutes part of the context in which children's conceptions have to be interpreted. In other words, we will draw conclusions about children's way of thinking in relation to how the educational milieu is at present structured and also discuss some of the implications of the present study in this respect.

Thus we must look at the ideas of learning assumed in the educational settings of pre- and primary school. If we examine the themes, like colour and form, or traffic, or classroom discussions in general in pre-school, the child is assumed to understand that he is learning something about the world around him. We have seen that most children do not make this connection to the world outside pre-school themselves. We also know that all levels of education in school from primary school on are based on the assumption of general knowledge. Francis (1982) followed a group of children through their three first years at school, and described how children tend to set about the task of learning - to read and write, each in his own way. She distinguishes three categories of readers, the skilled readers, the slow readers and the late beginners.

The skilled readers have grasped some understanding of the act of reading and writing. She characterizes these children as:

> *... making active attempts not only to listen, but also to read. Take part in the kind of dialogue which is the basis for learning, being able to question, explain and consider alternatives and to give some thematic account of events. (p. 67)*

The slow readers perceive that reading and writing have something to do with beginning school, something that can be done or not, and do not see these as constantly developing skills, or as abilities to be valued throughout life.

The late beginners are children who give no indication of reading at all during the first year in school and still have great difficulty in reading after three years. Characteristic of these children is that they have no understanding of what reading and writing are about. In contrast they learn to perceive and copy patterns and have no understanding. These children also share the situation that they have no support from home. Similar findings have also been reported by Dahlgren & Olsson (1980) and Ahlberg (1981),(see p. 40).

Francis states that home circumstances seem to be detrimental to learning for many of these children. But what then is the problem in the learning milieu of school?

> *What children in this study conveyed through their actions, questions and comments was that they were trying to work out what schooling was about. Their lack of understanding inclined them towards learning by rote. Passive memorising, reading, might 'happen' to the child. (p. 134)*

Some children neither grasp why they are in school nor the idea of reading and writing. These children are the poorest learners.

In one of the interviews in the present study a girl, Katarina (6:0), said that she was learning to make clocks when she was involved in the theme of "learning the time"; and in another situation, Stefan (6:4) said that he learnt to make road signs when involved in the theme of "traffic". Let these two children constitute examples of what happens when the child has not grasped the idea of learning TO KNOW when exposed to teaching which takes such a conception for granted. Obviously these children also learnt to make a clock and a road sign respectively, but for the teacher these activities were means of reaching the goal: learning the time and knowledge about traffic.

In relation to the child's conception of learning or conception of other similar phenomena attention must be paid to those aspects on which that particular learning depends.

In relation to reading, Lundberg et al (1980) point out the necessity of linguistic awareness to be a skilled reader. Skilled reading presupposes an awareness of the linguistic aspects of speech. More generally, this means that, to grasp a phenomenon, the child must be aware of the idea on which this phenomenon is based.

12.3.3 Ideas and reality in pre-school

One of the main assumptions of this study was that the context in which conceptions develop is of great importance. We will now try to describe the social and ideological context within which awareness of learning has been studied[16].

What experience do children acquire in pre-school? Experiences can of course vary in the individual pre-school, but viewing praxis as well as written documents from the 1970's, one can see that the social aspects of education dominate in pre-school. One can also note that pre-school is not in general seen as a school but more as a place to play for differing periods of time during the day. Teachers in pre-school never present their milieu as a place for learning, and teaching is a term hardly ever used. If a plan is made up, this concerns what to do with the children, or what theme to work with; what the child is supposed to learn is hardly ever explicitly expressed. To make a critical point, we think that the child experiences a number of isolated activities which are never for him integrated into a whole. He is engaged in free-play most of the day, with no interaction with the teacher unless he comes into conflict or misbehaves, in which case the teacher is involved. According to Ehn (1983), this is due to the great stress on order in pre-school.

What does this entail for how children perceive learning in the context of pre-school? It seems clear that, in their conceptions, they do not perceive pre-school as a learning milieu. The questions: "What do you learn at pre-school?" and "What do you think your teacher wants you to learn?" might throw some light on the meaning of experience with regard to learning. Roughly half the children say that they do not learn anything at pre-school, or that they do not know what they learn there. (Roughly half means more specifically 75 % of the four-year-olds, 50 % of the five, six and seven year olds, and 25 % of the eight year olds). In contrast they say they play. A few children comment like Stina (6:4): "No we don't learn anything, we are allowed to do whatever we want to".

This statement is an example of what Ehn (ibid) says constitutes the other aspect of pre-school, namely uncertainty. Every pre-school teacher has to erect her own norms and rules and the climate of dialogue exists under the cover of democracy.

> *A golden rule is that as an adult, you should show children consideration and respect, be decent. The child's will should be encouraged, their needs satisfied, as much as you are able. You should preferably not force anyone to do anything. Everybody should have 'a good time'. These guiding principles which have been cultivated, lead to something which in a large number of situations seems to be a general*

> *lack of demands. An enlightened raiser of children should not impose demands on the children; the children should preferably want themselves to do what is best for them. You can possibly use coaxing as a method of steering their will.*
> *(ibid, p. 57/our translation)*

If we look back at the other half of the children who were able to give examples of learning at pre-school, to a very large extent they perceive learning in terms of learning TO DO THAT (see appendix 9 and table 30, p.194). This means that *learning at pre-school largely stands for learning "how" to behave*. Thus, it seems as if the social goals of the Child Care Act are what children encounter in relation to learning. It is most probably in such situations that the teachers use the notion of learning, for example "Pelle, you have to learn to wash your hands before dinner" or "Eva, you have to learn to stop shouting indoors" etc.

Let us look at the three official aims of pre-school; self-confidence, communication and concept-formation (p.55). What do we *communicate* in this respect to children in pre-school? It seems that grown-ups are there to say what is right and wrong with regard *to social behaviour* since here the teacher's role seems distinct to them. Another part of the communication can be described in terms of "not caring". If children perceive their days as periods during which they are allowed to do whatever they want to and they perceive this as "just play", we communicate to them that they are not important. Parents do not expect any learning in pre-school either. They are, as a rule, satisfied if their childrens are taken care of and, at best, enjoy their days there. We also communicate to children that before the age of seven, on entering primary school, they are not to be counted on with regard to learning. Learning with a capital "L" is something distant, a secret the child will be involved in when coming to school at the magical age of seven. It is not only the adults in pre-school who communicate these things to children, children also communicate them to each other. Ehn (op cit) shows how children also reproduce the communication patterns of adults in pre-school: children also try to foster each other by referring to the proper order as defined by teachers.

In relation for *self-confidence*, pre-school children play for fun, while adults or older children learn. This tells the pre-school child that learning is a phenomenon which has very little, if anything, to do with himself. Playing is just something children do and can be interrupted whenever the adult decides. The children's self-confidence can be influenced in a negative way when he perceives himself having no value in comparison to older children who are allowed to attend another world: the world of learning.

Concept-formation is also supposed to be the focus of pre-school activities. In our opinion, the notion of learning ought to be central to concept-formation, but from this study it does not seem as if teachers find it important. They do not in any case try to make it explicit to the child.

If this rather critical view of the Swedish pre-school is in any way correct, we must ask ourselves if we should continue to treat children's pre-school years as unimportant from an educational point of view. Phrased a little more specifically, one can say that the ideology behind the Swedish pre-school is to some extent to *save children from* *learning*. The idea seems to be that, since children have to struggle in school soon enough and we now have enough money in our welfare society to let children play and enjoy their early years, they should be allowed to do so. This idea of developing the "natural child" is not only a Swedish ideology. Bruner (1980) describes the ideology of pre-school activities in England in similar terms.

> *Pre-school is neither to give an elementary education nor to prepare for one, but to help develop the natural child. (p. 17)*

A real problem in the task of forming an explicit goal in fostering young children in pre-school is the mixture of care and education (Ferri et al, 1981). In the confrontation between these two different perspectives, the policy in Sweden has been toward care or, more specifically, towards putting a label on care as "educational settings". This can be seen as Holter (1974) points out, in relation to other contradictory perspectives of social institutions as a way of solving a conflict via ideological statements.

One could summarize these remarks on pre-school by saying it focuses on developing the child via a stimulating milieu. Responsibility for learning is to a large extent on the child, or left at random. We know that learning is a highly culture-bound phenomenon and also that today's ideal of knowledge in our society is characterized by the striving towards an abstract symbolic level. But do we in any way try to help children towards our society's ideal? In this study we have looked at the child at the threshold of our adult culture. The child's experiences in everyday life are to be seen in his conceptions of the world around.

The childrens world of concrete thoughts is still only affected in a limited way by the culture. But we know how adaptable children are during these early years, and we can ask ourselves if we really assume the responsibility for developing their inherent possibilities.

Children learn from the educational settings they experience in pre-school. Their awareness (or lack of awareness) is an expression of their way of thinking in relation to the experiences they have met. Let us now look, however, at the educational implications of the findings.

12.4 Educational implications

In this last section we will present some reflections on the work in pre-school as a whole. In part, these reflections can be seen as possible implications of the findings presented previously[17].

There is a lively contemporary debate on lowering the age for children beginning at primary school. A State Commission "Pre-school - Primary school Commission" has been set up with the purpose of investigating and reporting on co-operation between pre-school and primary school. The first documentation of the Commission was called "Towards the samegoals" (På väg mot samma mål, 1982). Although the Commission has still not made any suggestions for directions in the future, one could say that the "educational wind" in society blows towards more structured activities. The Central Board for Social Welfare Service has requested that an expert group work out suggestions for the content of pre-school activities. This first step towards a more content-oriented pre-school proposes five groups of subjects: language, orientation in the world, orientation in nature, picture and shape, sound and movements. But what about "the same aim" in co-operation with primary school?

There is certainly nothing wrong in childrens learning different tasks and subjects. But *let us not apply the methods or content of primary school in the pre-school*, however tempting it may be to divide time in pre-school into small units or subjects in order to satisfy ourselves as teachers. Learning is good for a child, but it is even more important *to experience one's existence as meaningful.*

What then should one offer our young children in this country? The dialogue-pedagogical intentions of BU (Barnstugeutredningen, see p. 56) were in reality a misjudgement resulting in loose structure and vague content. Neither do the strictly structured learning situations of primary school seem a good alternative.

Having rejected the dialogue-pedagogic as well as the strictly structured pedagogy of school, what can we do with our pre-school children? We think there is a third way. The best investment we can give our children is *to help them grasp what they do, to develop their awareness towards a positive attitude in learning.* How can we work with this as an aim in pre-school? First, we have to accept the cognitive domain of the child as well as the social, where the latter is entirely in focus today. The most valuable skill we can teach a child in pre-school is the skill "to think" and reflect about himself and the world around him. To influence a child's way of thinking, there must be opportunities for the child to think and reflect.

Sylva (1980) talks about giving the child opportunities to participate in what she labels as challenging activities, e.g. activities which stretch the capacity of the mind. Examples of what she defines as challenging activities are the three Rs[18] examination, problem solving and adult-directed arts and crafts.

Sylva (ibid) made an observation study in play-groups and nursery-schools in England and found very little of what she labels as challenging activities when children participated together in a class-discussion. Her recommendations about improving pre-school practice were as follows:

> 1. *Make the most of materials/activities with clear goal structure. With them, children can progress to complicated schemes in a self-initiated and self-sustaining manner.*
>
> 2. *Encourage children to work in pairs. Teachers do this already because they want children to acquire social skills. They might do it even more, however, as it has been shown to improve the intellectual level of children's play.*
>
> 3. *When staffing permits, encourage the subtle tutorial.* (p. 76)

Sylva's third suggestion is probably the most important in making children aware of their actions and learning. Adults have to involve themselves in the child's world. They have to point out and make clear the "whole" to the child: to put the child in situations which place demands on him to reflect about his own activity; *or to make explicit what the child* *takes for granted.* This does not mean that all activities with pre-school children must be on an individual basis. There are number of other social aims which must be dealt with in terms of groups. To work with children "as a group" is *one* very important aspect of pre-school activities (Korpi, 1983). But communication, which ought to influence thinking, must be based on a communication which reaches the child. Thus the teacher must listen to the child to establish how he really reasons and perceives the world around him; the teacher must become aware of the child's thinking.

The child's concrete reality in pre-school seems to be a clear starting point, and he can get help from the teacher to reflect about this.

One should not stay at the level of the immediate experience, however: the child's reflections should be used as a way of forming his thinking in a direction which the teacher ought to have a very clear picture of. We should know about the ways in which children think, but we should also be aware of the ways in which we would like to change their thinking.

What then should the content of pre-school be? First, the *educational situation* carried out in pre-school *should be in accordance with the child's way of thinking.* The second aspect to be considered is the *philosophy* of learning.

Our own view is very much in agreement with the stress on the content of pre-school but it is neither the school-like content of our primary school nor that of the Indian pre-school we have in mind. What we would like to argue is that content should be dealt with more in terms of ways of thinking and ideas to be acquired rather than in terms of "school-knowledge". By paying attention to what the teacher takes for granted we should throw light on the children's way of thinking.

By listening to, and observing, children the teacher must work with aspects of the child's reality which are meaningful and important to the child. One aspect of the content in pre-school is to direct children into making reflections about their own knowledge and learning. This can be done by thematization or problematization in discussion about what and how they learn.

Though we have characterized thinking in a specific context, and believe that thinking develops in a social context, thinking as a skill can also be of a more general character. Bono (1983) says:

> *For example, the willingness to look for alternatives is a generalizable thinking habit. And deliberate provocation is a technique that can be applied to generate ideas in any sitaution.*
> *(p. 706)*

The habit of reflecting and thinking is surely something we can direct children towards, and since children do not spontaneously reflect about their own thinking, we must assist them. The teacher must become aware of the child's way of thinking not in terms of a general developmental trend, but in relation to important aspects of the child's everyday experiences at pre-school. Wood et al (1980) showed in a study how teachers participating in children's activities also become more sensitive to children's needs in other situations. To participate in the child's play on equal terms sometimes means to subordinate oneself to the child. The order is changed and the adult does not have control and, since many teachers are mindful of their status, it is a very sensitive situation to become actively involved in children's play (Ehn, 1983). Children in pre-school are engaged in many activities. These activities can be at differing "levels of importance", to keep the child occupied or to challenge the child's abilitites. Teachers in pre-school often take for granted that learning comes as a consequence of an activity. If learning is seen in terms of manual skills this is probably true, but if learning is seen in terms of a qualitative change in the child's way of thinking, there has to be another element involved in the activity.

The view of learning as a consequence of an activity places all the responsibilitiy of learning on the child. But another way to look at learning is in terms of the responsibility of the adult. In the latter case, the adult must be actively involved in the activities of the child. Let us take an example. A child plays with water over a period of years merely because he enjoys the experience of water. But during the experiments with water the child can also learn about density, the properties of material, measurement etc and for this to occur, the active involvement of the tacher is needed. Knowing and understanding do not follow as a consequence of action alone, but understanding of basic notions can be established in experiences which the child shares with grown-ups.

It has been shown in this study that there are many received ideas of learning, knowing, understanding, which - it is tacitly assumed - the child does not share with adults. And obviously he does not change his way of thinking only as a result of being exposed to experiences which, from the adult point of view, should make the phenomena of learning, knowing, and understanding obvious. We believe, the child's awareness would be raised by the teacher making the child reflect on a theme.

In a similar ways there are received ideas of reading, writing, counting and knowing the world. Seldom are these mode explicitly to objects of reflection, in spite of the fact that practically all subsequent learning is based on them.

Most children certainly acquire this basic understanding of the various aspects of the world on their own. Some do it slowly and with great difficulty; some never do it.

It is rather obvious that children need guidance to attain to modern society's way of thinking. Piaget (1980) says:

> *Considering that it took centuries to arrive at the so-called new mathematics and modern, even macroscopic, physics, it would be ridiculous to think that without guidance toward awareness of the central problems the child could ever succeed in formulating them himself.* (p. 16)

According to Piaget, knowledge is not a reproduction of reality, but an active transformation of the categories of experience a person uses in his interaction with the world. Piaget maintains that the most important goal of bringing up children is the creation of individuals who are capable of producing new things and not only reproducing what other generations have done earlier. Hundeide (1977) says:

> *The child does not develop himself by correct answers, but by getting challenging tasks which exert his capacity to the utmost e.g. concrete problems or requests which the child can work with from own premises.*
> *(p. 99/our translation)*

The importance of co-operation is also dealt with. Hundeide refers to Doise (1975) who has shown in an investigation how children who co-operate go further in their "operative constructions" than children who work alone.

Let us go back to the Swedish pre-school. If the perspective which we propose is to have any implications for the child's everyday life in our pre-schools, teachers must first accept this as a relevant perspective on knowledge. More explicitly, *the teacher has to see learning as a change in meaning* and has to listen to, and become observant of, the child's way of thinking.

With this view of knowledge the child's experiences in pre-school should be more than social training. There should also be room for using one's head to reflect and think about the activities one is involved in. We have seen that the ideas of learning as learning TO KNOW and as learning TO UNDERSTAND presuppose the ideas of TO KNOW and TO UNDERSTAND. It would surely be a great help for teachers to become conscious of what children's conceptions are in relation to central and important concepts in pre-school. This can be done by further investigations but perhaps it is even more important to make the teacher sensitive to the problem of the possible effects of her teaching. What has been grasped by the children; in what way has their thinking been affected? Obtaining this kind of feed-back should be just as important a part of the daily-work in pre-school as is the planning for a meaningful content.

From this point of view, we do not so much see learning as a function of the child's ability but rather as a function of the experience he is involved in. This can perhaps create teacher resistance, since a changed way of working with children assumes a different way of thinking about them.

We see the interview method as a tool here. In learning to make clinical interviews with children, one gains concrete experience of the child's way of thinking which is then difficult to ignore in everyday work with children.

It is the aim of this study to focus attention on metacognitive aspects of the child's reality which can open up helpful new insights into the child's way of thinking. This knowledge can then help us to understand what *is possible and what is meaningful to do in pre-school.* In Sweden, the expansion of pre-schools is a relatively late phenomenon, and hence research in the field is very limited. Since our knowledge of the child's everyday experience in today's society is very restricted, research can, and should, provide an important contribution in this area.

NOTES

1) The child is defined as he throughout the thesis.

2) In the empirical section of this work, pre-school will be used consistently as a notion for day-care as well as part-time pre-school.

3) Socialstyrelsens rapport till regeringen den 14 maj 1982.
Swedish National Board of Social Welfare: Governmental Report, 14 May, 1982.

4) The staff could be pre-school teachers, leisure-time teachers and teaching assistants. There is a cook in the kitchen as well as a cleaner.

5) E=experimenter. S=subject.

6) An interview as a whole is analysed and constitutes an example and an aid for the person who judges the results for reliability. (See app.1)

7) Compare the appealing simplicity of the children's way of characterizing learning with one of the definitions most widely referred to, that of Bower and Hilgard (1981). They state that learning:

> "refers to the change in a subject's behavior or behavior potential to a given situation brought about by the subject's repeated experiences in that situation, provided that the behavior change cannot be explained on the basis of the subject's native response tendencies maturation or temporary states of the subject (e.g. fatigue, drunkenness, drives, and so on)." (p 11)

8) We should indicate here the perhaps comfusing fact that in this and the following chapter the numbers refer to both headings and categories of description.

9) One child of those who had not begun primary school suggested that she would learn to KNOW about animals in primary school.

10) This conception of learning as an improvement implies thinking in terms of continuity, i.e. events separate in time are seen as related to each other. A similar form of thought was also found in cases when some children talked about changes in their way of thinking.

11) In percent of each age group. Refers to all tables in chapters 9 and 10, as well as to the tables in the appendices.

12) Within this main category as well as other subsequent main categories, there is a tendency towards more advanced conceptions with consecutive order.

13) Just as ability to do something depends on circumstances, identity may also change as a function of situational variation. This phenomenon was remarked on by Piaget (see p. 21) and by de Vries (1969) in a paper about constancy of generic identity in the early years. He placed a mask of a dog over the face of a cat behind a screen, but with the tail of the cat visible to the child all the time. For younger children (3 years old) the cat changed identity into a dog, when they saw the cat with a mask on its head.

Outside this investigation, I have noticed the same phenomenon working in a day-centre with children 2-4 years old when I played with a hand-doll in the shape of a cat. When I pretended that the cat ran out into the garden efter I had spoken to it, all the children ran to the window to look for him. When they asked for the cat later and I showed them the hand-doll, they said: "No, the other cat". This was repeated several times and I could never convince them that the hand-doll was the same cat I played with in front of them.

14) Knowledge was previously learnt by oral tradition so that, with the advent of books some centuries ago, people showed a great scepticism for the written word. (Claudy 1979)

15) In certain positions the high degree of agreement can constitute artifacts since some categories have few conceptions. Hence an estimation of marks in percent has been given by both of us. In this case, the problem is that, when the category is not present at all (as has been the case sometimes), the value is 0. The median-value in this case was 95%, both for the categories accounted for in chapters 9 and 10 and for those in appendices 3, 4, 5, 6 and 7.

$$p = \frac{2\ n_{22}}{n_{.2} + n_{2.}} \cdot 100$$

The author's estimation constituted the basis for assessment.

16) This section is not entirely based on the empirical studies accounted for on the previous pages. The implications of the results of the present study have been interwoven with the author's background knowledge of the Swedish pre-school, acquired during many years of practice and theory, in a way which makes it impossible always to discern the exact source of each remark and conclusion.

17) We are fully aware of the fact that pre-school education also has to deal with other needs of the child, e.g. to give the child opportunities to learn practical skills, to work with experiences in free-play activities, to create, to exercise fine and gross motor activities, etc, but we do not deal with these aspects, only with how cognitive development could be worked with in pre-school.

18) The three R's are reading, writing and arithmetic.

19) The aims of examining TO KNOW and TO UNDERSTAND described in appendices 4 and 5 are the same as the aims described here.

20) These two questions about "thinking" were not given in sequence but on different occasions in the interview.

21) It is very common that children exchange numbers for letters like Daniel here.

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APPENDIX 1

Judgement instructions

Chapters 9 and 10 comprise judgement instructions. We will only briefly point out the main ideas in analysis here. The basis of interpretation of the "how" aspect of learning is always the "what" aspect of learning. The interview as a whole is utilized and, where particular questions are of interest, this is always explicitly said in relation to a category.

The interview below with Andreas (6:7) is an example of how a categorization is made. Every statement of the child is looked upon from the possibility of categorizing according to the categories of the study. Thus, a map is made for every child over categories found in the interview as a whole. In the following interview, every possible statement is categorized, while in the judgement of every child, every category is only marked once, even though if can occur many times in the same interview. Everything which has been utilized in interpreting is underlined in the interview.

It is important to stress that a child can express examples which can be categorized in a main category, but not necessarily in a sub-category. But if a child gives expression to a conception which is organized in a sub-category, it is always possible to categorize the statement in a main category as well.

Andreas 6:7

E: Can you tell me something you've learnt?

Learning= TO DO THAT BY DOING

S: I've learnt a bit about traffic and that. Here at the day-centre.

E: What did you do when you learnt about traffic?

S: We learnt when we went out for a walk and that. We learnt then.

E: I see. But what did you do when you were out walking and you learnt?

S: Well, they showed us what we should do and that, get used to doing it.

E: Do you learn anything else at the day-centre?

Learning= TO KNOW

S: That for example you have to know that you can't steal just as you want like. That I learnt and ... I don't know if there was anything else.

E: Can you learn anything when you play?

S: Not that I know.

E: You haven't learnt anything when you've been playing?

S: I don't think so.

E: What do you think the teacher wants you to learn at the day-centre then?

S: Can't say... it's probably a lot.

E: Does she tell you what she wants you to learn?

S: No, I don't know but I know what we had to learn in traffic.

E: Can you ride a bike, Andreas?

S: Ride a bike, I could ride a bike early.

E: Can you tell me what you did when you learned to ride a bike?

S: First I had a 3-wheeler at home and then I got Magnus's orange bike and that I had support wheels for but not for long. And then I got a new one that I had without a support wheel.

E: How did you know when to take the support wheels off?

S: I don't know.

E: But how do you know when you can bike so you don't need support wheels any more?

Learning TO DO by PRACTISING

S: Maybe you feel it ... I felt I didn't need the support wheels, they don't touch I felt and then all at once I felt that and said to daddy, he could let go and it was O.K.

E: How do you know when you know about traffic you said you were learning about. How do you know that you know what to do in the street?

S: Well, I don't know so much, but something. When you have to cross the street, I learnt and...

Learning TO DO as a change from CANNOT to CAN

E: How do you know you know all that now? How do you know you know something?

S: Well, it's probably so that you feel like now I know. I think that's the way it is, you feel it.

E: Do you remember how you thought when you learned to bike?

S: I can't remember quite.

E: What do you think you thought?

S: He held the carrier when I was learning and then I said: you don't need to. They didn't dare but I could do it even if they didn't hold.

Learning TO KNOW by DOING

E: If you wanted to know how far it was from here to the moon, how would you go about finding out?

S: You'd have to go to the moon in a rocket.

E: Do you think there's any other way of finding out?

S: There must be but I don't know what way. I can't think of it.

E: Can you phone someone without looking up the number?

S: I can phone home.

E: How come you can ring home?

S: It's just to look at the phone. Our number's on the phone, so you don't need to look in the directory.

Learning HOW TO DO by EXPERIENCE through PRACTICE

E: But if you get a new pal today at the day-centre and want to learn his phone number by heart, how would you go about it?

S: Ask mymummy when I was home and thenphone a lot of times and then you know it by heart.

E: Can you learn by heart in one day if you want?

S: No, I don't think so.

E: Tell me something you know.

TO BE ABLE HOW TO DO By EXPERIENCE PERCEIVING someone SHOWS

S: I know the address home.

E: How've you learnt your home address?

S: I think it started that I asked mummy what it was called when I was little and then she said it and all at once I knew it. And then I read on the store-room the number there.

E: Can you play an instrument?

S: I don't know but I'm good at the mouth-organ, I know. I can play the mouth-organ a bit.

E: How did you go about learning the mouth-organ?

S: In the beginning I just blew into it and then a lot of notes came out. First at places where you could hold in different ways ... and then I just did this.

HOW TO DO by EXPERIENCE doing PRACTICE

E: But if you want to be very good at playing. How would you go about learning to play all sorts of songs?

S: You have to practise I think.

E: How do you go about practising then?

S: You practise all the time.

E: Tell me something you know.

S: ... I know two kinds of cones.

E: How come you know that?
TO KNOW= S: Well, I learned it here at the day-centre when I was out in
TO KNOW the woods once looking for mushrooms. And do you know what
ABOUT sort of cone this is,said.. and I didn't know. It was a
SOMETHING pine-cone and this well, I knew, it was a spruce-cone, so
I learned.
E: Do your mummy and daddy know anything you don't know?
TO BE ABLE S: They know a lot ... daddy knows quite a lot about computers
= TO KNOW that I don't know.
E: How come he knows a lot about computers?
TO KNOW S: He works at L.M.Ericson and he works with computers.
by DOING E: Do you know a child who knows something you don't?
S: Don't know. But it's difficult to say ... my big brother
TO BE ABLER you know he knows maths much better than me, much better,
HOW TO DO in all sorts of things.
E: Why's he better?
S: Don't know. He thinks it's such great fun to go to school
now.
E: Is there anything you know which all the other kids don't?
S: This was difficult this .... (no answer)...
E: What would you like to know to do most of all?
TO BE ABLE S: I'd like to be able to do magic tricks.
= TO DO E: How would you go about learning to do magic tricks?
S: You can't really do it.
BY E: Can't you learn to pretend to do tricks?
EXPERIENCE S: Yes, I know some, daddy's taught me, I know how to conjure
PERCEIVING balls from my ears.
SOMEONE E: What'll you learn when you start school?
SHOWS S: I'll learn to read a lot.
Learning= E: Do you have to go to school to learn to read?
HOW TO DO S: No, I can read quite well anyhow, but I don't know the vowels,
Learning as I can't write, I'm sad to say , but I don't know the consonants and vowels.
a change
from CAN E: Why do you have to learn all that then?
to CAN S: You write mistakes so easily, write a lot of mistakes.
OTHERWISE, E: Have you learnt anything by looking at T.V. anytime?
SOMETHING S: Yes.
ELSE E: What?
Learning S: I've learnt a little about how you play the mouth-organ,
HOW TO DO by just a little. I don't know if I learned anything else.
A MEDIUM E: What would you like most of all to know?
S: To know ... to know how they make pistols and rifles and
TO KNOW= such like. To do it quickly. That's what I think is so
TO KNOW strange. Would like to know how they're put together so quickly.
ABOUT
SOMETHING E: How can you find out?
S: You'd have to go to one of those factories.
By
PERCEIVING E: Tell me about something you understand.
BEING THERE S: That I understand? ... I know how clouds are made.
TO UNDER- E: How come you know that?
STAND = S: I've learnt ... I know some water rises up and it makes,
TO KNOW then it's air ??? and then clouds are made.
E: How come you understand and know how it happens?
TO KNOW S: I've learnt. Once in the group I think we'd put up a poster
THROUGH A afterwards where there was a lot of arrows and they showed
MEDIUM how the air went.
E: How does it feel to understand something?
S: If you've got to know you feel happy, but when you get old,
it is nothing.

E: How do you know you've understood then.. if the teacher has told you something, how do you know you've understood?
S: You remember probably ... and I've understood this.
E: If you don't understand something, what do you do then?
S: I ask .. about it.
Learning E: Can you learn anything by reading books?
TO KNOW S: Mmm ... you can learn some ... there are of course those
BY A about those things you learn. There are mushroom books.
MEDIUM E: Do you know what is meant by thinking out something?
S: No..o...
E: When you sit thinking and then you think something out, do you usually do that?
S: Yes.
E: Have you found something out anytime when you've been sitting thinking?
FINDING S: Once I thought, found out that that I now make it, a moon
OUT HOW rocket I thought like, and then I made a whistle instead.
TO DO E: Did you make a whistle instead?
S: Mmm.
E: Do you think you think the same way now as when you were little?
S: No..o..
THINKING as E: What's the difference then?
a change S: I think a little better now.
from THINK E: What do you mean "better"?
to THINK S: Well, before I didn't think about much and now I think a
BETTER little more. Then I didn't think about what I did before but
THINK to now I think about it a little better.
THINK OTHER-
WISE IN E: Can you find out by thinking?
ANOTHER S: Mmmm. You can think things out.
WAY E: Yes, what do you usually think out?
S: I think something out like and that.
E: Is there anything you'd like to understand that you don't
TO UNDER- understand?
STAND = S: I'd like to understand how an aeroplane is made. I don't
TO UNDER- understand how they can get up.
STAND WHY E: How can you learn to understand that?
TO UNDER- S: You have to be able to ask someone.
STAND BY E: If you wanted to know how music comes from a radio, how
PERCEIVING would you find out?
S: You'd have to ask someone who knows.
TO KNOW BY E: Who can you ask?
PERCEIVING, S: You don't know who knows. You can ask the people you know.
SOMEONE E: Mmm.
SAYS WHO
KNOWS

APPENDIX 2

Interview questions in the main study

1. Tell me about something you have learnt.
   - how did you learn that?
   - how did you know when you knew that?
   - how do you tell whether you have grasped something or not?

2. Tell me something you learnt at the pre-school.
   - tell me something you learnt in the class discussion.
   - can you learn things when you are playing?
   - is there something your teacher wants you to learn?

3. Can you ride a bike?
   - how did you learn that?
   - do you remember what was going through your mind when you were learning to ride a bike?
   - what are you thinking about now when you are riding your bike?

4. If you wanted to know how far away the moon was, how would you go about finding that out?

5. Do you know what to do to phone someone up?
   - can you call someone without looking up the number?
   - how could you learn a phone number by heart?
   - if you get a new pal at pre-school today, can you learn her telephone number before you go home? How would you do that?

6. Tell me something you are able to do.
   - how did you learn that?
   - can you play a musical instrument (swim, throw a ball)?
   - how did you learn to play better, etc.?

7. Tell me something you know.
   - how come you know that?

8. Can your mother and father do something that you can't?
   - how are you going to learn to do that?

9. Do you know another child who can do something that you can't?
   - how does that come about?
   - how are you going to learn to do that?
   - can you do something which other children can't do?

10. What would you most like to be able to do?
    - how are you going to learn to do that?

11. What are you going to learn when you start primary school?
    - do you have to go to school to learn to read and write?
    - why do you have to learn to read and write?

12. Have you ever learnt something from watching TV?

13. Is there something you'd like to know about?
    - how are you going to be able to find out about that?

14. Tell me something you understand.
    - how is it that you understand that?
    - how does it feel when you understand something?
    - how do you know when you have understood something?
    - what do you do if there's something you don't understand at all?

15. Can you learn something from reading books?
    - has anyone ever taught you something by reading a book to you?
    - what was it you were taught?

16. Do you know what "thinking about something" means?
    - are you used to doing that?
    - have you ever found out something by thinking about it?
    - is it possible to get to know something by thinking (about it)?
    - do you feel you now think in a different way from when you were younger? Could you give me an example?

17. Of all the things you don't understand at the moment, which would you most like to understand?

18. If you wanted to know how it is that you can hear music on the radio, how would you go about finding that out?

19. If a young child comes up to you and asks "what does it mean to learn", what would you say?

The structure of the questions in the main interview study.

These questions should be seen as a question outline to be covered to the greatest possible extent with regard to the child's responses. Questions begin by being very broad and open-ended to give children the chance to suggest things themselves. The first question has usually been raised more than once.

Questions then increase in difficulty, and also become more specific as the interview proceeds. Every notion or aspect of learning has been brought up on different occasions and in different contexts to give the child a number of opportunities to elaborate on his thoughts.

APPENDIX 3

The child's conception of TO BE ABLE

We have had three aims in the study of children's conception of TO BE ABLE: [19]

A. To acquire a wider and more solid base to develop questions about the "how" aspect of learning.

B. To find out if the child had the ideas of TO BE ABLE, TO KNOW and TO UNDERSTAND though not connecting them with learning.

C. To find out if the children were able to differentiate between these notions.

Direct questions asked to establish children's conceptions of TO BE ABLE were:

> Tell me something you are able to!
> Do you know another child who can do something that you can't?
> Can you do something which other children can't do?
> Are your parents able to do something which you can't?
> What would you most of all like to be able to do?

How then did the children perceive and respond to these questions?

The main structure of children's conceptions of TO BE ABLE is similar to the conceptions TO KNOW and UNDERSTAND, which means that all three notions could be combined with each other as follows:

$$\begin{bmatrix}\text{TO BE ABLE}\\ \text{TO KNOW}\\ \text{TO UNDERSTAND}\end{bmatrix} \qquad \begin{bmatrix}\text{TO DO}\\ \text{TO KNOW}\\ \text{TO UNDERSTAND}\end{bmatrix}$$

Figure 5. Structure depicting possible combinations of concepts and conceptions.

Thus, TO BE ABLE is perceived by children in terms of being able TO DO, TO KNOW and TO UNDERSTAND. The same pattern and notions are found in relation to each of the notions suggested by the interviewer. This is not fully true, since, depending on which notion is in focus, the pattern will look somewhat different. Not only the pattern of answers but also differentiation in the form of sub-categories will be different depending on the question directed to the child.

Children's conceptions of TO BE ABLE can be described in the same categories as learning (see p. 92) but in relation to TO BE ABLE, the category of TO BE ABLE TO UNDERSTAND has to be looked at as a possible logical category, though it does not exist in the empirical data. Conceptions of TO BE ABLE in terms of TO DO and TO KNOW are in no way different from these conceptions in relation to the "what" aspect of learning and for this reason there will be no illustrations from interviews here.

When children talked about TO BE ABLE in terms of TO DO, one group of children exchanged the meaning of TO BE ABLE TO DO with the notion of "may", or "being allowed to". These conceptions are not categorized but two examples are given:

Stina 4:9
E: Are your parents able to do something which you can't?
S: They can go through the basement. I can't because it's so dark in there.

Stig 5:5
E: Are your parents able to do something which you can't?
S: They can go and see horror films and be up late in the evening.

Since there is nothing of interest to be said here beyond our previous remarks on the qualitative description of categories of conceptions of TO BE ABLE, let us look briefly at the quantitative aspect.

Age trend

Table 16. The child's conception of TO BE ABLE

	Age 3	4	5	6	7	8
TO DO	69	79	93	39	100	96
TO KNOW		7	19	26	4	16
TO UNDERSTAND						

Note in table 16 how the youngest children (3 years old) can to a greater extent tell something they are able TO DO than something they have learnt. TO BE ABLE TO is a notion which is reached earlier than TO BECOME ABLE TO (which is the notion of learning). It seems more or less fortuitous if a child happens to talk of TO BE ABLE in terms of TO KNOW. On the other hand, TO DO (i.e. become able) is the most important conception of TO BE ABLE.

Table 17. The child's conception of TO BE ABLE TO DO

	Age 3	4	5	6	7	8
HOW TO DO	69	75	93	93	100	96
TO DO THAT		7	11	7	7	4

As we can see in table 17 very few children relate TO BE ABLE to DO THAT, while as we have seen in table 5, p. 102, children related TO DO THAT to learning. If a child is asked about something he is ABLE TO, he will most probably respond by mentioning a manual skill or activity.

APPENDIX 4

The child's conception of TO KNOW

Our aim in relation to the child's conception of TO KNOW is similar to the child's conception of TO BE ABLE. The direct questions to find out children's conceptions of TO KNOW were:

> Tell me something you know!
> Is there something you would like to know about?

TO KNOW is categorized in the main categories previously described. But as TO KNOW is in focus here, it is this conception which will be differentiated into sub-categories.

Although the main categories are the same as children's conception of the "what" aspect of learning, we will give some brief descriptions of how children express TO KNOW in terms of TO DO, TO KNOW and TO UNDERSTAND. Before we deal with each category separately, we would like to illustrate in figure 6 the relations between the different ways in which children conceptualize TO KNOW.

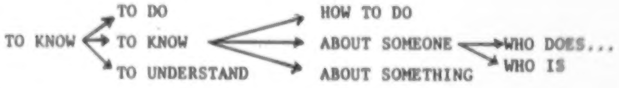

Figure 6. The structure of the child's conception of TO KNOW.

The child's conception of TO KNOW in terms of TO DO

Answers categorized here are to questions of TO KNOW which can be described in terms of TO DO. This means that if the child gives a response to a question of TO KNOW and this is categorized here, the child has not differentiated between TO DO and TO KNOW. He has interpreted TO KNOW as TO DO; something which he wants TO BE ABLE TO DO.

Daniel 3:6
E: Is there something you would like to know about?
S: Know that I think it's fun to go by boat. I've been in Bengt's boat once and I fell in .. and I got to steer Bengt's boat.
E: If you want to get to know something, what do you do?
S: I usually go out and tell Kalle.

Angelique 4:6
E: What would you most of all like to know?
S: How to water flowers.
E: How would you find out how to water flowers?
S: You just hold like this ... (shows)

Johan 4:6
E: What would you most of all like to know?
S: I want to know about how to sail an Optimist.

Instead of saying something they would like to know these children mention things they would like TO BE ABLE TO DO or ARE ABLE TO DO.

The child's conception of TO KNOW in terms of TO KNOW

Since TO KNOW is in focus here, the child's conception of TO KNOW will be elaborated and illustrated with children's interviews. TO KNOW means you have acquired or wish to acquire some kind of *information* or *knowledge* about something in the surrounding world. When children talk about TO KNOW as categorized here, they always do so in terms of some of the differentiated sub-categories. For this reason examples and illustrations will be given in relation to the following categories: TO KNOW HOW TO DO SOMETHING, TO KNOW ABOUT SOMEONE, or TO KNOW ABOUT SOMETHING.

TO KNOW means TO KNOW HOW TO DO

In this category TO KNOW means that the child expresses TO KNOW HOW TO DO SOMETHING. The child talks about skills and activities, but in terms of his knowledge about HOW TO DO or his wish to be able to KNOW HOW TO DO something or in terms of his knowledge about something one ought not to do. The child can also express knowing something he has done.

> *Lotta 4:0*
> *E: Tell me something you know ...*
> *S: I know how to steer a bike.*
>
> *Jennie 5:7*
> *S: There's so much I'd like to know... I'd like to know how you make a Maypole. I still haven't learnt how you sew for it.. how you make lamps and such like, so it works..*

Jennie (5:7) expresses a conception which can be categorized in at least two of these categories. The part of the statement which allows categorization here is Jennie's wish TO KNOW how to sew, since she is still not able to do this. The last part of her statement, an expression of a wish TO KNOW how a lamp is constructed will be categorized in the category of TO KNOW SOMETHING and will be described later.

TO KNOW means TO KNOW ABOUT SOMEONE

When a child talks about TO KNOW in the way his conception is categorized here, he expresses knowledge about a person. The person the child refers to is either DOING something or IS something. TO KNOW is knowledge about someone in the child's immediate world. This conception is always possible to categorize in one of the two categories which follow, and thus no illustrations by interview will be given under this heading.

TO KNOW means TO KNOW about SOMEONE WHO DOES something.

This means that the child relates TO KNOW to knowledge about a person who has done, is doing, or will do, something.

> *Lisa 6:2*
> *E: Tell me something you know.*
> *S: I know my daddy builds houses. I've seen how he lays bricks.*
>
> *Martin 5:11*
> *E: Tell me something you know.*
> *S: I know Eva (elder sister) usually goes riding every Tuesday.*
>
> *Niklas 6:7*
> *E: Tell me something you know.*

> *S: I know.. have to think .. there's a lot of things but I can't choose what to say .. I think they're so stupid .. that mummy runs, mummy runs quite a lot, she was going out yesterday.*

Niklas (8:7) talks about his mother who is often DOING a particular activity, namely running.

TO KNOW means TO KNOW about someone who IS

TO KNOW can, for a child, be TO KNOW about someone: a person who IS something. This may refer to a quality or qualification of a person.

> *Caroline 5:6*
> *E: Tell me something you know.*
> *S: I know my mummy's called Ulla.*
>
> *Joakim 4:8*
> *E: What would you most of all like to know?*
> *S: What all the kings and queens looked like.*

Some children's expressions categorized here focus more on someone who possesses something.

> *Ulrika 5:7*
> *E: Tell me something you know.*
> *S: I know my mummy has a wig.*

TO KNOW means TO KNOW about SOMETHING

This is the more general conception of TO KNOW, a conception which is related to the adult perspective of knowledge. TO KNOW is connected here with knowledge about something. Often this refers to how things are made or produced.

> *Ola 4:6*
> *E: What would you like to know?*
> *S: How you make boats.*
>
> *Joakim 4:8*
> *E: Can you tell me something you know.*
> *S: There aren't any trolls and brownies.*
> *E: How come you know there aren't?*
> *S: Because I've always believed it, but daddy's said there aren't any.*
>
> *Fredrik 6:6*
> *E: Tell me something you know.*
> *S: I know a bit about Viking ships and Indian boats and that. Indian boats are made of birch-bark.*
>
> *Hanne 8:1*
> *E: Tell me something you know.*
> *S: That the sun is fire.*

Note how the child's conceptions TO KNOW are also related to TO DO, either in terms of himself or someone else. Moreover, the more general conception of TO KNOW something is often related to making something.

A brief description of how children perceive TO KNOW in terms of TO UNDERSTAND can be seen in the next category of description.

The child's conception of TO KNOW in terms of TO UNDERSTAND

Conceptions categorized here are reflected by response to questions of TO KNOW describeable in terms of TO UNDERSTAND. The child understands or wants to understand something instead of just knowing. There is an explanation given or an explanation asked for (in terms of a "why" question). Answers here entail a lack of differentiation between knowing and understanding.

> *Charlotta 6:8*
> *E: Is there anything you'd like to know.*
> *S: I don't really understand how flowers can grow under the ground.*
>
> *Maria 5:9*
> *E: Is there anything you would like to know?*
> *S: Why you always have to work, that I don't understand.*
>
> *Fredrik 5:1*
> *E: What would you like to know?*
> *S: I'd like to know how space works. I've a book I hardly understand anything of.. this thick ...*

These children choose examples which include some kind of understanding instead of just something which they want TO KNOW. Conceptions are often questions of "why" in this category; why something is in one way or another.

Charlotta (6:8) already knows that flowers grow under the ground, but does not understand how this can be the case. Maria (5:9) knows that one has to work, but cannot grasp why. And finally Fredrik (5:1) has a book about space, but the book is difficult to understand and he wishes he did. Here one has of course to be careful since it is sometimes difficult in everyday language to distinguish between TO KNOW and TO UNDERSTAND.

The frequency of conceptions of TO KNOW in relation to the different categories of description can be seen in the following tables.

Age trend

By looking at the frequencies in table 18 in relation to the main categories of description, we will acquire a general idea about how children are able to discriminate TO KNOW from TO DO or TO UNDERSTAND.

Table 18. The child's conceptions of TO KNOW

	Age 3	4	5	6	7	8
TO DO		32	30	26	18	16
TO KNOW		21	56	77	86	88
TO UNDERSTAND			4		4	4

At about five years of age, half the children have a conception of TO KNOW in terms of TO KNOW. This conception then steadily increases with age, at the same time as TO KNOW in terms of TO DO decreases. But one fifth of seven and eight year olds still exchange TO DO with TO KNOW. This means that after one year in primary school, there is not a total differentiation in all children between TO DO and TO KNOW. We can also note the limited extent to which the exchange between TO KNOW and TO UNDERSTAND is made. We can see in table 19 how the definition of TO KNOW is divided into sub-categories.

Table 19. The child's conception of TO KNOW in terms of TO KNOW.

	Age					
	3	4	5	6	7	8
HOW TO DO		14	26	19	36	44
ABOUT SOMEONE		11	33	26	32	36
ABOUT SOMETHING		4	26	63	46	48

Generally one can say that all these different conceptions increase with age. Note the great expansion of the more general notion of knowing, represented here in the category TO KNOW about SOMETHING, by the age of six. This outline of children's conceptions of TO KNOW has to be seen from the child's point of view as a preference: what he prefers to relate to the notion of TO KNOW (and not what he is competent of relating it to).

Table 20. The child's conception of TO KNOW about SOMEONE

	Age					
	3	4	5	6	7	8
SOMEONE WHO DOES		4	11	15	25	24
SOMEONE WHO IS		11	22	11	14	20

As we can see in table 20 there is no notable difference worth stressing in the extent to which the two sub-categories of TO KNOW about SOMEONE occur, though the frequency of these conceptions also seems to increase by age.

In summarizing children's conceptions of TO KNOW, we could say that the child expresses TO KNOW about "doing" clearly. There is also increasing differentiation with age between TO DO and TO KNOW, and a larger repertoire of conceptions with increasing age. It is also evident how TO KNOW is related to people, a fact also noted in relation to the acquisition of knowledge (see p.119ff.).

APPENDIX 5

The child's conception of TO UNDERSTAND

Our reasons for examining the child's idea of the notion of TO UNDERSTAND are similar to the other notions examined (see Appendix 3).

Conceptions of TO UNDERSTAND in terms of TO DO, TO KNOW and TO UNDERSTAND are similar to the categories described previously in Appendix 4. However, we will describe briefly how the child expresses TO UNDERSTAND in relation to the main categories. Here, a more thorough description will be made in relation to TO UNDERSTAND in terms of TO UNDERSTAND since this has been in focus. These questions were asked:

> Tell me something you understand.
> What would you most of all like to understand?

Before we deal with each category separately, we would like to illustrate in figure 7 the relations between the different ways in which children conceptualize TO UNDERSTAND.

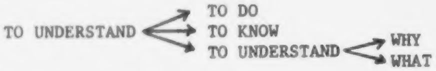

Figure 7. The structure of the child's conception of TO UNDERSTAND.

The main categories of children's conceptions of TO UNDERSTAND, namely, TO DO, TO KNOW and TO UNDERSTAND will be looked at individually.

The child's conception of TO UNDERSTAND in terms of TO DO

Answers are categorized here when the child responds to the questions of TO UNDERSTAND in terms of TO DO. Thus, the child cannot distinguish TO DO from TO UNDERSTAND.

> *Johanna 3:11*
> *E: Is there anything you think is difficult to understand?*
> *S: Yes.*
> *E: What?*
> *S: Cutting firewood.*
>
> *Conny 4:11*
> *E: Tell me something you understand now that you didn't understand when you were little.*
> *S: When I was little I had a three-wheeler which I rode. When I got big, I got a two-wheeler.*

The child's conception of TO UNDERSTAND in terms of TO KNOW

TO UNDERSTAND means here that the child exchanges this notion with TO KNOW. The child has got TO KNOW something and gives this as a response to a question about TO UNDERSTAND, i.e. the child has not differentiated between TO KNOW and TO UNDERSTAND.

Jenny 6:9
E: Is there anything you can tell me which you've understood?
S: I've understood that crows aren't the same as bullfinches.

Henrik 6:10
E: Is there something you'd like to understand?
S: There's electricity and that.

Johan 5:7
E: Tell me something you understand now that you didn't understand when you were little.
S: I didn't understand then how you make roofs.

The child's conception of TO UNDERSTAND in terms of TO UNDERSTAND

When the child talks about TO UNDERSTAND in relation to questions of TO UNDERSTAND, he expresses a relation or an explanation of something. Another level of TO UNDERSTAND is when he expresses TO UNDERSTAND in terms of changed meaning of something. Since all conceptions are describeable in one of the sub-categories, we will proceed to these categories for exemplification. Children's conceptions of TO UNDERSTAND in terms of TO UNDERSTAND can be categorized in the sub-categories of WHY or WHAT.

The child's conception of TO UNDERSTAND as TO UNDERSTAND WHY

The conception of TO UNDERSTAND here is characteristic of an *explanation* or a *relation* between phenomena. How something is related to something else is a question of WHY.

Ann-Charlotte 7:0
S: I've understood when mummy says that I shan't laugh .. I usually laugh when my little brother does things he shouldn't do.. I understand when my mother says that I shouldn't laugh because then he does it even more .. he thinks it's fun himself.. I get that.

Erica 6:9
S: I understand for example that you shouldn't play with the oven because you can get burnt.

Camilla 7:4
S: First I didn't understand why there was a king ... first I thought the king decided everything but then I got to know that it was all the parties and that the king was left from olden times.

Camilla 8:8
E: Tell me something you understand.
S: I understand you have to learn things because otherwise you don't get a job when you're grown up.

The child's conception of TO UNDERSTAND as TO UNDERSTAND WHAT

This is a conception which is very advanced and is characterized by a *change in the meaning* of something. Conceptions in this category are in a clear way related to thinking. This way of conceptualizing TO UNDERSTAND resembles the view of learning underlying the research of the INOM group which has provided the present work with its methodological context (cf. p.37).

Catarina 8:3
S: For example, if I didn't understand about traffic when I was three, though I knew what cars were.

Annica 7:4
E: Can you tell me something you understand that you didn't understand when you were smaller.
S: That when mummy and daddy talk properly on the phone when ... news is good or that, I didn't understand.
E: Do you understand now?
S: Yes.
E: How come you understand now when you didn't before?
S: Just because I've heard that word a lot and mummy and daddy have explained it to me.

This conception is very advanced so that very few children express it. But let us look in more detail at how frequently conceptions of TO UNDERSTAND are distinguished in main and sub-categories.

Age trend

Children exchange conceptions here in a way similar to the previous notions examined.

Table 21. The child's conception of TO UNDERSTAND

	Age					
	3	4	5	6	7	8
TO DO		11	52	26	29	28
TO KNOW		14	30	52	75	76
TO UNDERSTAND			7	19	21	24

Note in table 21 how totally prominent the exchange between TO UNDERSTAND and TO DO is for the five year olds, where there is the beginning of a response to the notion of TO UNDERSTAND. TO UNDERSTAND is interpreted by most children as TO KNOW; three fourths of the oldest seven and eight year olds also exchange TO KNOW with TO UNDERSTAND. TO UNDERSTAND in terms of TO UNDERSTAND is never met in more than one fourth of the group of children and here too it is among the oldest age group.

As seen previously children are able to differentiate TO UNDERSTAND from TO DO and TO KNOW in only a very limited number of cases. To conceptualize TO UNDERSTAND in terms of changed meaning is even less frequent as can be seen in table 22.

Table 22. TO UNDERSTAND in terms of TO UNDERSTAND

	Age					
	3	4	5	6	7	8
WHY			7	15	21	20
WHAT				4	4	4

Note the differentiation between conceptions with increasing age, and the difficulty in distinguishing between TO KNOW and TO UNDERSTAND which is not always distinguished in language by adults.

APPENDIX 6

The child's conception of changes in THINKING.

As seen in Appendix 5, TO UNDERSTAND is to a very limited extent conceptualized in terms of WHAT, which entails a change in meaning. Since this conception implies "thinking", there have been two direct questions about "thinking". The direction of questioning has been changed, "thinking" was suggested by the interviewer's question and the child had to answer "what" he had been thinking about or in "what" way he had changed his way of thinking.

The purpose of this change is to extract a more complete picture of *whether children have any understanding of change in terms of "thinking"*. In relation to talking about learning to ride a bike, one question was directed:

> Do you remember what was going through your mind when you were learning to ride a bike?
> What do you think about now when you are riding your bike?
> Do you feel you now think in a different way from when you were younger?
> Could you give an example? [20]

The conceptions expressed here can be seen as a differentiation of TO UNDERSTAND in terms of WHAT, i.e. a change in meaning.

The resulting categories depicting the different ways in which the child conceptualizes changes in "thinking" resemble the different conceptions of learning as BECOMING (MORE) ABLE TO DO (see p.182 ff). The general structure can be seen in fig. 8.

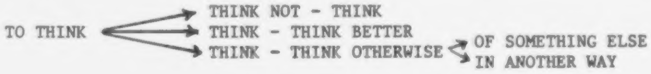

Figure 8. The structure of the child's conception of THINKING.

TO UNDERSTAND as a change from THINK NOT to THINK

The child expresses his own change in "thinking" in terms of first not being able to THINK and then later being able to THINK. As in the category of CANNOT to CAN (see p.96) the conceptions were categorized though the child did not explicitly express what occurred earlier, but gave examples of "what" he was able to THINK now. There are a few children who say they do not remember what they thought about when they were younger. They are, however, categorized here if they can mention "what" they THINK about now. The opposite also holds: when the child expresses that he was not able to THINK earlier though he does not give an example now. Thus, the child does not have to make the comparison.

> *Fredrik 6:4*
> *S: When I was little, 1 or 2 for example, I just thought DA DA.*
>
> *Erica 6:4*
> *E: How do you think differently now from when you were younger?*
> *S: I didn't think anything then.*
> *E: Well, what do you think now then?*
> *S: I think about a lot of amusing things now.*

TO UNDERSTAND as a change from THINK to THINK BETTER (MORE)

The child expresses a *quantitative change* in his "thinking". Although he often uses the word BETTER, he means MORE. Thus the child is aware here of the expansion of his thoughts.

> *Andreas 6:7*
> *S: Think better now.*
> *E: What do you mean by "better"?*
> *S: Well, before I didn't think so much ... now I think a little more. And I didn't think before about what I did, but now I think about it a little better.*

> *Victoria 7:1*
> *E: In what way? (Refers to thinking differently.)*
> *S: Well, I didn't think so much when I was small. I think more now than I did when I was small, I think.*

TO UNDERSTAND as a change from THINK to THINK OTHERWISE

The child here expresses a *change of "thinking" in a qualitative way.* This means that he is able to THINK OTHERWISE than previously. Conceptions characterized as a change towards THINK OTHERWISE are always possible to describe in one of the two sub-categories; TO THINK OF SOMETHING ELSE or TO THINK IN ANOTHER WAY.

THINK OTHERWISE means THINK OF SOMETHING ELSE

The child sees it as if he *is "thinking" of different phenomena.* Thus, he is able to compare what kind of things, activities or phenomena he was "thinking" about earlier, and what is in his mind now.

> *Tobias 7:6*
> *S: I thought it was a bit tiring to ride a bike with a support wheel and I thought I almost never learn and thought I'd try without and took off the support wheel.*
> *E: But what do you think of now when you bike?*
> *S: I think most about where I bike since I've got so used to biking at home. Want to bike far to see a bit otherwise. I don't think it's so much fun.*

> *Marie 7:7*
> *E: Do you think you think differently now from when you were younger?*
> *S: Yes.*
> *E: Can you tell me in what way?*
> *S: I usually think of a lot of other things now than when I was small. For example, when I was younger I just thought of food and such like.*
> *E: What do you think of now then?*
> *S: Now I think of whether some pal is going to be with me and what to do and that and write letters to my pal and..*

THINK OTHERWISE means THINK IN ANOTHER WAY

The child expresses here another way of thinking than previously. Thus, he has to THINK about *the same phenomenon, content or context in a different way.*

> *Ursula 6:8*
> *E: Do you remember how you thought when you learned to bike?*
> *S: Yes, that I shouldn't ride so quickly.*
> *E: Did you think not to bike so quickly?*
> *S: Mmm.*
> *E: How do you think when you bike now then?*
> *S: Well, I think, you can ride quickly, you can ride slowly, you can brake ... you can lift yourself up...*
>
> *Linus 7:5*
> *E: Do you remember how you thought when you learned to bike?*
> *S: Yes, I thought I'd fall off.*
> *E: How do you think now when you're riding a bike?*
> *S: I think it's not so dangerous now when I'm on the bike.. I think about whether I'll bike to someone or what to do.*
>
> *Anna 6:8*
> *S: I always thought that I was afraid of falling off when I was little.*
> *E: Do you think differently now?*
> *S: I have to be ready in case a car comes.*

Anna (6:8) talks about her own relation to the activity of cycling. When she began to ride her bike she was thinking of herself; she was afraid of falling and being hurt. But today she is concerned not only with herself but also with the traffic. She is concerned with being hurt, now as before, but because of other people on the road and not on account of her balance.

Age trend

We will look at the frequency with which children's conceptions of THINKING were found.

Table 23 The child's conception of changes in THINKING

	Age					
	3	4	5	6	7	8
THINK NOT - THINK		7	11	26	29	12
THINK - THINK MORE			4	11	18	36
THINK - THINK OTHERWISE			4	22	21	32

In looking at the child's awareness of his own thinking, one can see in table 23 that it does not really start until the age of six. It exists only occasionally at lower age levels. However, from six years of age at least one fourth of the children express an awareness of the fact that they think. We can then see that, with increasing age, there is an increase not only in the extent to which the children are aware of the fact that they can think but also in the extent to which this awareness includes the notion of qualitative differences in thinking (i.e. changes in meaning).

This goes, of course, far beyond what could be expected at these ages on the basis of Piagetian theory.

Table 24. The child's conception of changes in THINKING in terms of THINK OTHERWISE.

			Age			
	3	4	5	6	7	8
OF SOMETHING ELSE			4	7	11	32
IN ANOTHER WAY				15	7	12

Note in table 24 that one third of the oldest children are aware that they think about different "things" now than previously.

As mentioned earlier, two different questions were used in this categorization; thinking in relation to riding a bike now and then, and a more direct question if there was any difference between the child's thinking today and as a younger child.

Table 25. The child's response to two different questions about "thinking".

Thinking in			Age			
relation to:	3	4	5	6	7	8
riding a bike			7	33	36	28
thinking differently		7	4	30	30	60

There are no noticeable differences in table 25 until the oldest age group where it suddenly seems to be easier for them to answer the most direct question when asked to compare their thinking now with previously.

It seems as if children at the level of eight years of age take a dramatic step in their awareness about their own thinking, to the extent that they are able to reflect and compare earlier levels of thinking and their thinking now. We see here one more example of how children are more capable of giving responses to questions and notions at a more advanced level than they prefer to give spontaneous expressions to.

Children's conceptions of thinking are also an expression of a qualitative as well as a quantitative change seen in terms of continuity and improvement, and this we have seen elsewhere (see p. 96).

Our results show a dramatic difference compared to the Piagetian view which relates thinking about one's own thinking to the formal operational stage. This is most probably due to the fact that we confront the child with different questions of a direct character, while Piaget made conclusions about these phenomena from the child's way of solving problems or talking about other phenomena.

APPENDIX 7

The child's conception of TO FIND OUT by THINKING

Learning in terms of LEARNING TO UNDERSTAND does not seem to exist at all until the age of eight, but since the most important aspect of learning in terms of TO UNDERSTAND is the child's awareness of his own thinking, his own creation of an understanding, this has been examined by a particular question. Thus we have facilitated the child's task by suggesting TO FIND OUT BY THINKING in the question, while they only give an example of *what* they have found out by thinking. After asking the child first whether he knew what it means to find out something by thinking, the following question was asked:

> Have you ever found out anything by thinking? Give me an example.

We want to stress that the following description of the child's conception of TO FIND OUT BY THINKING does not have the same status as the previous results since it is not directly related to learning, although the starting point with many of the children in this respects has been, can you learn anything by thinking? But since this question only gives a response of yes or no (or nothing at all) the discussion about thinking finally ended in TO FIND OUT BY THINKING.

We can see, in figure 9, the same structure in what the child perceives as the WHAT aspect of learning. (See fig.2.)

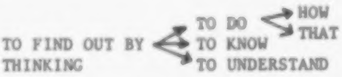

Figure 9. The structure of the child's conception of TO FIND OUT BY THINKING.

TO FIND OUT TO DO

As previously, it is possible to categorize conceptions of TO DO into the two sub-categories HOW and THAT. Let us see how children perceive TO FIND OUT TO DO in these categories.

TO FIND OUT HOW TO DO

Conceptions in this category refer to how the child has found out HOW TO DO, to make or to construct something. To find out HOW TO DO means that the child is able to imagine what something will look like and then do it in practice.

> *Johan 8:6*
> *E: Can you tell me something you've thought out.. something you've discovered?*
> *S: Take for example ... this is a pencil with a rubber on it.. and then you find ... we put the pen down there on that pen and the rubber's like this ... so you put this pen, this pen is there and then we do this, so that the pen that was like that and the one that was like that can also do that ...*

Johan (8:6) is describing how to construct an experiment with pencil and rubber.

> *Olof 7:6*
> *E: What have you found out with Lego?*
> *S: Building ... I play with them ... the parts I have to build things with...*

TO FIND OUT TO DO THAT

Conceptions in this category refer to WHAT TO DO in a particular situation, e.g. to go over to friend, or call someone on the phone etc. The child does not have to imagine anything, he merely has to FIND OUT THAT he is going to do something.

> *Orrit 6:9*
> *S: That I want to play with someone in the yard or that someone will come to my house.*
>
> *Johan 4:6*
> *S: If I found out ... I'll build a plane, then I think I'll go out and ride my bike and then I go out and ride it.*
>
> *Carolin 5:6*
> *S: I've found out that when you're in the middle of a fight, you should in fact say something and then the fight'll stop.*

TO FIND OUT TO KNOW

Conceptions in this category refer to TO FIND OUT something you already know, i.e. you are able to *remember* by thinking.

> *Anna 5:0*
> *E: Can you find out anything by thinking?*
> *S: Yes, if you remember something somebody's said, then you can do it.*
>
> *Tobias 7:6*
> *E: Have you done it anytime? Do you usually find out about things by thinking them out?*
> *S: Yes, once I was going to say something to mummy and daddy but they were talking and I didn't want to interrupt and I waited a while and then I forgot ... and then I thought and remembered.*

TO FIND OUT in terms of remembering dominates this category, but one child offers another way of TO FIND OUT, i.e. TO KNOW in terms of *imagination*: one is able to imagine a situation or place from the knowledge one has. Catarina (8:3) provides an example of trying to imagine a new situation.

> *Catarina 8:3*
> *S: Like before mummy got my little sister, then maybe you can think how it looked like at the hospital before the first time (she went there).*

This is a more advanced conception of TO FIND OUT by knowing than remembering, but since this answer of Catarina's is the only one of its kind it has been categorized here.

TO FIND OUT TO UNDERSTAND

Thinking is here *a means of attaining* comprehension. The child refers TO FIND OUT to an *insight* or an *understanding*. This means that the child has to be actively creative himself.

> *Anna 6:8*
> *E: Can you tell me something you've thought out?*
> *S: That 2 and 2 are 4.*
>
> *Eva 6:6*
> *E: Have you got to know anything when you've sat thinking?*
> *S: Yes, I've sat and thought what Y and O and U mean and then I've found out ... YOU (the child spells out the Swedish word for you,"Ni".)*
>
> *Ronnie 7:5*
> *E: Have you found out anything by thinking?*
> *S: Maybe I've thought something out when mummy tells a riddle.. then you have to think out what it can be ...*

Age trend

After this qualitative description of children's conceptions of TO FIND OUT BY THINKING, we can see in table 26 at what ages we find the number of children able to respond.

Table 26. Outline of the total number of children, able to answer in each age group.

	Age						
	3	4	5	6	7	8	Total
All children		1	4	9	19	20	53

53 children altogether out of 149 can give some response, or are in some way aware of how to use their own thinking for different purposes. Note also how the two oldest age levels dominate totally in this respect. The division in the qualitatively different categories can be seen in table 27.

Table 27. The child's conception of TO FIND OUT BY THINKING

	Age					
	3	4	5	6	7	8
TO DO		4	15	26	57	56
TO KNOW			4	7	14	20
TO UNDERSTAND				7	4	16

Note here how the aspect of TO FIND OUT TO DO is very dominant. Moreover, in the children's understanding thinking is mostly used TO FIND OUT TO DO something. There seems to be a dramatic increase in the child's awareness about his own thinking between six and seven years of age.

Table 28. The child's conception of TO FIND OUT TO DO

	Age					
	3	4	5	6	7	8
HOW TO DO				15	25	12
TO DO THAT		4	15	22	32	44

As we see in table 28 it is more common for the child to perceive that he utilizes his thinking TO FIND OUT TO DO THAT than HOW TO DO something.

If we return to the child's conception of learning in terms of TO UNDERSTAND we can compare it with TO FIND OUT BY THINKING since the child has to show an awareness of his own mental activity in both cases. It must be recalled that only 8% of the eight-year-olds related learning to understanding spontaneously, but when the direction of the question was changed, and the "how" aspect (TO FIND OUT BY THINKING) fixed, double the percentage of these children were able to relate their own thinking to understanding. Some children at lower age levels are also able to do so.

APPENDIX 8

The child's conception of "what it takes to learn a phone number".

In one of the pilot studies there was a question about remembering:

> Suppose your teacher tells you that tomorrow we are going to swim, how would you make certain not to forget to bring your swimsuit?

A similar question was suggested in the main study:

> Suppose you get a new friend today at the day-centre whom you want to phone tonight, how would you go about learning his telephone number?

It is interesting to note with regard to the first question how children mention trust in someone else, e.g. that the teacher will write it down, or their mothers will remind them, but there are also suggestions about placing the swimsuit in their way, so they would not miss it in the morning. Only a few said they would repeat it to themselves. These findings are similar to Kreutzer, Leonard and Flavell (1975) in their interview study about children's knowledge of their memory.

We will now look in more detail at our categorization of the possibility of learning a telephone number. Many children did not accept the possibility of learning a telephone number since they said they were too young. But let us look at those categories where answers to a question like this are found.

Children who accept and describe how to be able TO DO (make a telephone call) are all categorized in terms of learning by EXPERIENCE. This categorization must also constitute an example of how one particular question is categorized.

The categories in which learning a new phone number can be found are:

Learning by DOING
PERCEIVING
THINKING

Thus there are three different ways in which children perceive learning a new phone number, mirroring the three main sub-categories of LEARNING BY EXPERIENCE described above.

Learning TO DO by DOING

This conception means that the child has to learn to phone by looking at a note which someone has written down. The note is something central. When the child has dialled the number many times, he is able to throw the note away, but no one believes that this can happen after just one day's practice. There is an idea about a *time factor which is important*: "it takes a long time".

> *Robert 8:6*
> *E: If you get a new friend today and want to learn his phone number, what would you do?*
> *S: Then I ask him and maybe he writes it down on a piece of paper and then I read it a lot of times and then I know it finally.*

> *Anniaa 7:4*
> *E: How have you gone about learning the phone number by heart?*
> *S: I often ring to my pals and then you get used to ringing the number.*

The child himself has to be actively involved in the DOING here and repetition is of central importance.

Learning TO DO by PERCEIVING

This conception means that the child must learn the telephone number by listening to someone who says it or looking at someone dialling. The note with the written number is also central in this conception. Most of these children do not yet think they are able to learn the number in one day. They do not see themselves as actively involved in the learning. *The time factor is also important here.*

> *Sofia 6:1*
> *E: But how come you know your phone number by heart?*
> *S: Because I've heard our number a lot more; mummy usually says it when she answers the phone.*

The child can learn either as an event which suddenly happens or as a consequence of repetition. There is a difference in the conception of learning as a consequence of hearing or seeing once, or hearing and seeing several times, as a condition for learning.

Learning TO DO by THINKING

The same dimension as in the previous category is of importance here, namely, the degree of repetition rather than the time factor. The child knows that by repeating the number many times, they will remember it. Thus, the child is able to learn a telephone number in a day. At this stage, too, the note is there to be looked at as an aid to memory but it does not have the same central role.

> *Linda 6:5*
> *E: How have you gone about learning your phone number?*
> *S: I've just found out so much ... as soon as I'm going to ring it comes out.*
> *E: Where does it come from?*
> *S: My brain.*
> *E: If you get a new pal today at the day-centre and you want to learn his telephone number before you go home today .. how would you do that?*
> *S: I try to say it a lot of times till I remember it.*

> *Daniel 7:0*
> *S: I think of the letters (figures)*[21] *first there's that and that and that like and then you ring those and those.*

Let us now see to what extent these conceptions are found in relation to this question. It is important to indicate that here, as elsewhere, a child's answer can sometimes be an expression of more than one of these categories, e.g. a child can perceive learning a phone number as a combination of reading and thinking, etc.

Age trend

The frequency with which these answers were found can be seen in table 29.

Table 29. The child's conception of learning a phone number.

Learning by	3	4	5	6	7	8
			Age			
DOING			7	7	38	88
PERCEIVING			52	44	54	12
THINKING				11	7	36

We can see in table 29 how dominant the conception of learning a phone number is by someone showing, at least until the eight-year-olds who suddenly seem aware of all the possibilities of PRACTISING, to read and to think. Among the eight-year-olds, there are those who mention and combine two or more of these conceptions. Most of the children also think that they are able to learn a new phone number in a day.

Kreutz et al (1975) have asked the question: "What do you do when you want to remember a phone number?" Their findings are comparable. Most children up to third grade in school (8 years old) said they would write it down. But there is no further description of how to progress from "writing down". Only four children out of 60 up to third level suggest any kind of repetition. This gives some idea of the difficulty for children in relating thinking to learning in general.

Compared with the study of Kreutz et al, we can see that there is a far larger percentage in our study able to suggest some kind of repetition.

APPENDIX 9

The child's conceptions of how to learn TO DO THAT

When the 'how'aspect of learning is TO DO THAT , it is always the child who has brought it up. This is a conception which is most probably closely related to the context of pre-school (see p. 100). When the child talks about behaviour or acting in any way categorized as TO DO THAT , he perceives the how aspect of learning in terms of TO DO, or TO PERCEIVE.

In a logical sense, the conception of learning TO DO THAT BY THINKING is also possible, but this conception does not exist in the empirical material used in this analysis. A conception which could be categorized thus would be expressed something like "I have learnt not to hit young children, since I understand it must feel terrible for the little child" etc. The presentation described here is from the level of learning by EXPERIENCE.

Learning TO DO THAT by DOING

In conceptions categorized as learning TO DO THAT by DOING children relate the reason for learning to a concrete experience, an activity they have been involved in. This is a very precarious category since logically one can say that, whatever the situation referred to, there must have been someone who said what was allowed to be done or not and this is the activity the child has learnt. These children refer to a situation.

> *Anna 5:10 (tells about a game she has played in the group discussion)*
> *E: Can you learn anything when you play?*
> *S: When you aren't allowed to do something with something you play.. then you learn... that you shouldn't do that.*
>
> *Olle 6:1*
> *S: You should be nice and quiet children, not shout, if you shout you have to sit at the table or go outside and shout.*

Anna (5:10) refers to play material which should be played with in a particular way and not used for anything else. She has a conception of what is allowed or not with regard to play material. Olle (6:1), on the other hand, talks about the consequences of not doing that, namely behaving properly. But the reason for his learning how to learn to do THAT is a practical activity.

Learning TO DO THAT by PERCEIVING

Conceptions of how to learn TO DO THAT by PERCEIVING are the most common way of expressing learning in this respect. You learn TO DO THAT by noticing, listening to, or looking at, someone. In most cases it is someone who says DO THAT .

> *Jenny 6:9*
> *S: Because the teachers tell you ...*
>
> *Johan 5:7*
> *S: And I've learnt to rest..*
> *E: Why should you rest?*
> *S: Well, because you're tired when you've run so much.*
> *E: How do you know?*

S: Well, they (the teachers) have said so ... first when I started at the day-centre, that was when they said it.

Annica 7:4
S: That you should be quiet, sit still and not run around ... not run in the corridor and such like.
E: How did you learn that?
S: Well, because Christina has said it.

A child does not produce the conception of TO DO THAT as far as the "how" aspect of learning is concerned in every situation. However, we will present a quantitative survey of the conceptions explicitly expressed.

Age trend

Let us look at the frequency with which these conceptions were found in the main study.

Table 30. The child's conception of how to learn TO DO THAT

	Age					
Learning by	3	4	5	6	7	8
DOING		7	19	11	18	4
PERCEIVING		7	30	37	43	56

The results in table 30 show that the dominant conception is learning TO DO THAT by PERCEIVING and its frequency also shows an increase with age.

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